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(54) Title: LAUNDRY CARE COMPOSITIONS CONTAINING THIOPHENE AZO CARBOXYLATE DYES

(57) Abstract: Laundry care compositions comprising thiophene azo carboxylate fabric shading dyes and methods of treating a tex-  
tile comprising such laundry care compositions.



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## LAUNDRY CARE COMPOSITIONS CONTAINING THIOPHENE AZO CARBOXYLATE DYES

### FIELD OF INVENTION

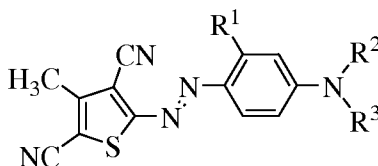
This invention relates to laundry care compositions comprising fabric shading dyes and  
5 methods of treatment of fabrics using such compositions.

### BACKGROUND OF THE INVENTION

As textile substrates age, their color tends to fade or yellow due to exposure to light, air, soil, and natural degradation of the fibers that comprise the substrates. To counteract this  
10 unwanted effect, laundry detergent manufacturers incorporate shading dyes into their products. The purpose of shading dyes is typically to counteract the fading and yellowing of the textile substrates by providing a blue-violet hue to the laundered fabrics, reducing the visual impact of the yellowing. In laundry care compositions dyes may be affected by interaction with laundry care adjuncts in the composition. This can lead to changes in the dye properties, such as  
15 deposition properties which may either not generate sufficient fabric shading or may lead to undesirable build up over time on fabric surfaces. There is a need to alleviate this problem.

### SUMMARY OF THE INVENTION

This invention relates to a laundry care composition comprising a laundry care adjunct and from 0.00001 wt% to 0.5 wt% thiophene azo carboxylate dye having the structure of  
20 Formula I:



Formula I

wherein  $R^1$  is selected from the group consisting of H, and electron-withdrawing groups, preferred electron-withdrawing groups being selected from the group consisting of F, Cl, Br,  
25 most preferably Cl;

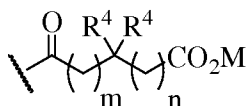
wherein  $R^2$  is  $(CH_2CH_2O)_yQ$  and  $R^3$  is  $(CH_2CH_2O)_{y'}Q'$ ;

wherein  $y$  and  $y'$  are integers independently selected from 1 to 39,

wherein  $8 \leq (y + y') \leq 40$ , preferably  $(y + y') \leq 35$ , more preferably  $(y + y') \leq 30$ ;

wherein  $Q$  and  $Q'$  are independently selected from the group consisting of H and  $Y$  wherein  $Y$  is  
30 as defined below; with the proviso that the dye comprises at least one  $Q$  or  $Q'$  group that is  $Y$ ,

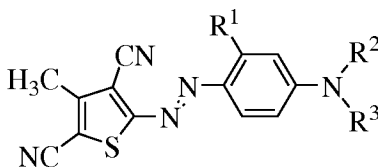
preferably Q and Q' are each an independently selected Y; and wherein Y is an organic radical represented by Formula II



Formula II

5 wherein independently for each Y group,

M is H or a charge balancing cation; m is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; n is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; the sum of m + n is 1 to 10, preferably 1, 2 or 3, more preferably 1 or 2; each R<sup>4</sup> is independently selected from the group consisting of H, C<sub>3-18</sub> or C<sub>4-18</sub> linear or branched alkyl, C<sub>3-18</sub> or C<sub>4-18</sub> linear or branched  
 10 alkenyl, and mixtures thereof, and wherein at least one R<sup>4</sup> group is not H, and preferably wherein  $0.4(y + y') \leq$ , more preferably  $0.6(y + y') \leq$  the sum of the number of carbon atoms in all the R<sup>4</sup> groups  $\leq 2.0(y + y')$ , more preferably  $\leq 1.8(y + y')$ , most preferably  $\leq 1.6(y + y')$ , and mixtures thereof. It may be preferred for (y+y') to be greater than 50, for example from 51 to 100, or from 51 to 78. The invention also relates to a method of treating a textile, the method comprising the  
 15 steps of (i) treating the textile with an aqueous solution comprising a laundry care adjunct and from 1ppb to 100ppm, more preferably up to 50ppm, of a thiophene azo carboxylate dye; and (ii) rinsing and drying the textile, the dye comprising a thiophene azo carboxylate dye having the structure of Formula I:



Formula I

20 wherein R<sup>1</sup> is selected from the group consisting of H, and electron-withdrawing groups, preferred electron-withdrawing groups being selected from the group consisting of F, Cl, Br, most preferably Cl;

wherein R<sup>2</sup> is (CH<sub>2</sub>CH<sub>2</sub>O)<sub>y</sub>Q and R<sup>3</sup> is (CH<sub>2</sub>CH<sub>2</sub>O)<sub>y'</sub>Q';

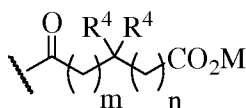
25 wherein y and y' are integers independently selected from 1 to 39,

wherein  $8 \leq (y + y') \leq 40$ , preferably  $(y + y') \leq 35$ , more preferably  $(y + y') \leq 30$ ;

wherein Q and Q' are independently selected from the group consisting of H and Y wherein Y is as defined below; with the proviso that the dye comprises at least one Q or Q' group that is Y, preferably Q and Q' are each an independently selected Y; and wherein Y is an organic radical

30 represented by Formula II

3



Formula II

wherein independently for each Y group,

M is H or a charge balancing cation; m is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; n is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; the sum of m + n is 1 to 10, preferably 1, 2 or 3, more preferably 1 or 2; each R<sup>4</sup> is independently selected from the group consisting of H, C<sub>3-18</sub> or C<sub>4-18</sub> linear or branched alkyl, C<sub>3-18</sub> or C<sub>4-18</sub> linear or branched alkenyl, and mixtures thereof, and wherein at least one R<sup>4</sup> group is not H, and preferably wherein 0.4(y + y') ≤, more preferably 0.6(y + y') ≤ the sum of the number of carbon atoms in all the R<sup>4</sup> groups ≤ 2.0(y + y'), more preferably ≤ 1.8(y + y'), most preferably ≤ 1.6(y + y'), and mixtures thereof. It may be preferred for (y+y') to be greater than 50, for example from 51 to 100, or from 51 to 78.

Preferred compositions and methods of the invention additionally comprise a laundry care adjunct or mixtures thereof.. Preferred laundry care adjuncts are selected from the group comprising first wash lipase and/or a dye transfer inhibitor selected from the group consisting of: polyvinylpyrrolidone polymers, polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, polyvinylloxazolidones, polyvinylimidazoles and mixtures thereof and/or a soil suspension polymer selected from the group consisting of amphiphilic alkoxyated polyamines, amphiphilic graft co-polymers, zwitterionic soil suspension polymer and mixtures thereof.

In one aspect of the invention, the composition is in the form of a single or multi-compartment unit dose laundry care composition.

Without wishing to be bound by theory, the dyes essential to the present invention provide a useful balance between deposition and build-up on fabric surfaces by a combination of ethoxylate groups and Y group(s).

## DETAILED DESCRIPTION OF THE INVENTION

### Definitions

As used herein, the term “alkoxy” is intended to include C<sub>1</sub>-C<sub>8</sub> alkoxy and alkoxy derivatives of polyols having repeating units such as butylene oxide, glycidol oxide, ethylene oxide or propylene oxide.

As used herein, unless otherwise specified, the terms “alkyl” and “alkyl capped” are intended to include C<sub>1</sub>-C<sub>18</sub> alkyl groups, and in one aspect, C<sub>1</sub>-C<sub>6</sub> alkyl groups.

As used herein, unless otherwise specified, the term “aryl” is intended to include C<sub>3</sub>-C<sub>12</sub> aryl groups.

As used herein, unless otherwise specified, the term “arylalkyl” is intended to include C<sub>1</sub>-C<sub>18</sub> alkyl groups and, in one aspect, C<sub>1</sub>-C<sub>6</sub> alkyl groups.

5       The terms “ethylene oxide,” “propylene oxide” and “butylene oxide” may be shown herein by their typical designation of “EO,” “PO” and “BO,” respectively.

As used herein, the term “laundry care composition” includes, unless otherwise indicated, granular, powder, liquid, gel, paste, unit dose, bar form and/or flake type washing agents and/or fabric treatment compositions, including but not limited to products for laundering fabrics, fabric softening compositions, fabric enhancing compositions, fabric freshening compositions, and  
10       other products for the care and maintenance of fabrics, and combinations thereof. Such compositions may be pre-treatment compositions for use prior to a washing step or may be rinse added compositions, as well as cleaning auxiliaries, such as bleach additives and/or “stain-stick” or pre-treat compositions or substrate-laden products such as dryer added sheets.

15       As used herein, the term “detergent composition” is a sub-set of laundry care composition and includes cleaning compositions including but not limited to products for laundering fabrics. Such compositions may be pre-treatment composition for use prior to a washing step or may be rinse added compositions, as well as cleaning auxiliaries, such as bleach additives and “stain-stick” or pre-treat types.

20       As used herein, “cellulosic substrates” are intended to include any substrate which comprises at least a majority by weight of cellulose. Cellulose may be found in wood, cotton, linen, jute, and hemp. Cellulosic substrates may be in the form of powders, fibers, pulp and articles formed from powders, fibers and pulp. Cellulosic fibers, include, without limitation, cotton, rayon (regenerated cellulose), acetate (cellulose acetate), triacetate (cellulose triacetate),  
25       and mixtures thereof. Articles formed from cellulosic fibers include textile articles such as fabrics. Articles formed from pulp include paper.

As used herein, the term “maximum extinction coefficient” is intended to describe the molar extinction coefficient at the wavelength of maximum absorption (also referred to herein as the maximum wavelength), in the range of 400 nanometers to 750 nanometers.

30       As used herein “average molecular weight” of the thiophene azo carboxylate dyes is reported as an average molecular weight, as determined by its molecular weight distribution: as a consequence of their manufacturing process, the thiophene azo carboxylate dyes disclosed herein may contain a distribution of repeating units in their polymeric moiety.

The test methods disclosed in the Test Methods Section of the present application should be used to determine the respective values of the parameters of Applicants' inventions.

As used herein, articles such as "a" and "an" when used in a claim, are understood to mean one or more of what is claimed or described.

5 As used herein, the terms "include/s" and "including" are meant to be non-limiting.

As used herein, the term "solid" includes granular, powder, bar and tablet product forms.

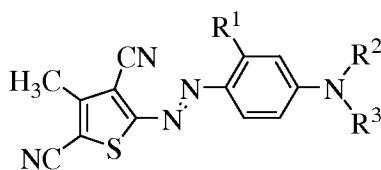
As used herein, the term "fluid" includes liquid, gel, paste and gas product forms.

Unless otherwise noted, all component or composition levels are in reference to the active portion of that component or composition, and are exclusive of impurities, for example, residual  
10 solvents or by-products, which may be present in commercially available sources of such components or compositions.

All percentages and ratios are calculated by weight unless otherwise indicated. All percentages and ratios are calculated based on the total composition unless otherwise indicated.

#### Dye

15 Suitable dyes are thiophene azo carboxylate dyes and mixtures thereof selected from those having the structure of Formula I:



Formula I

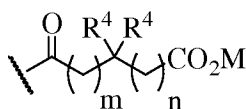
wherein  $R^1$  is selected from the group consisting of H, and electron-withdrawing groups,  
20 preferred electron-withdrawing groups being selected from the group consisting of F, Cl, Br, most preferably Cl;

wherein  $R^2$  is  $(CH_2CH_2O)_yQ$  and  $R^3$  is  $(CH_2CH_2O)_{y'}Q'$ ;

wherein  $y$  and  $y'$  are integers independently selected from 1 to 39,

wherein  $8 \leq (y + y') \leq 40$ , preferably  $(y + y') \leq 35$ , more preferably  $(y + y') \leq 30$ ;

25 wherein  $Q$  and  $Q'$  are independently selected from the group consisting of H and Y wherein Y is as defined below; with the proviso that the dye comprises at least one  $Q$  or  $Q'$  group that is Y, preferably  $Q$  and  $Q'$  are each an independently selected Y; and wherein Y is an organic radical represented by Formula II



Formula II

wherein independently for each Y group,

M is H or a charge balancing cation; m is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; n is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; the sum of m + n is 1 to 10, preferably 1, 2 or 3, more preferably 1 or 2; each R<sup>4</sup> is independently selected from the group consisting of H, C3-18 or C4-C18 linear or branched alkyl, C3-18 or C4-C18 linear or branched alkenyl, and mixtures thereof, and wherein at least one R<sup>4</sup> group is not H, and preferably wherein  $0.4(y + y') \leq$ , more preferably  $0.6(y + y') \leq$  the sum of the number of carbon atoms in all the R<sup>4</sup> groups  $\leq 2.0(y + y')$ , more preferably  $\leq 1.8(y + y')$ , most preferably  $\leq 1.6(y + y')$ . (y+y') values are average values as are for example carbon chain lengths, i.e the results or standard organic synthesis routes.

R<sup>1</sup> may be selected to influence the hue of the dye molecule. WO2012/166768 discloses dyes of similar structure but wherein R<sup>1</sup> is CH<sub>3</sub>. It has been found that replacing this methyl group (or longer chain alkyl groups) which are electron-donating, with an H or an electron-withdrawing group will provide a more reddish blue hue. The dye molecule can then be tailored to meet consumer preference for a particular bluish shade which varies in different geographical regions, though often tends to favor a more reddish-blue hue. It may be preferred for R<sup>1</sup> to be H. It may be preferred for R<sup>1</sup> to be an electron-withdrawing group. R<sup>1</sup> is H or R<sup>1</sup> is an electron-withdrawing group may be particularly useful with greater (y+y') average values, such as greater than an average of 5 or greater than an average of 8. These higher values increase deposition and removal control onto fabric surfaces but may tend to alter the hue of the dye to a more blue hue, so that a shift of the hue to a reddish blue is particularly useful.

Preferred anhydrides suitable for use in creating the Y moiety in the instant invention include, but are not limited to, the following: 3-(2-buten-1-yl)dihydro-2,5-furandione; 3-(2-hexen-1-yl)dihydro-2,5-furandione; dihydro-3-(2-octen-1-yl)-2,5-furandione; dihydro-3-(2,7-octadien-1-yl)-2,5-furandione; dihydro-3-(2-nonen-1-yl)-2,5-furandione; 3-(2-decen-1-yl)dihydro-2,5-furandione; 3-(2E)-2-dodecen-1-yl dihydro-2,5-furandione; dihydro-3-(2-tetradecen-1-yl)-2,5-furandione; 3-(2-hexadecen-1-yl)dihydro-2,5-furandione; dihydro-3-(2-octadecen-1-yl)-2,5-furandione; dihydro-3,3-bis(2-methylpropyl)-2,5-furandione; dihydro-3-(2-methylpropyl)-2H-pyran-2,6(3H)-dione; dihydro-3-propyl-2H-pyran-2,6(3H)-dione; dihydro-3,3-dipropyl-2,5-furandione; dihydro-3-octadecyl-2,5-furandione; dihydro-3-hexadecyl-2,5-furandione; dihydro-3-tetradecyl-2,5-furandione; dihydro-3-dodecyl-2,5-furandione; dihydro-3-decyl-2,5-furandione; dihydro-3-nonyl-2,5-furandione; dihydro-3-octyl-2,5-furandione; dihydro-3-heptyl-2,5-furandione; dihydro-3-hexyl-2,5-furandione; dihydro-3-pentyl-2,5-furandione;

dihydro-3-butyl-2,5-furandione; dihydro-3-(2-methylpropyl)-2,5-furandione; and dihydro-3-propyl-2,5-furandione.

Such suitable anhydrides may be obtained from one or more of the following: Sigma-Aldrich, St. Louis, MO 63178; City Chemical LLC, West Haven, CT 06516; Ryan Scientific, Inc., Mt. Pleasant, SC 29465; TCI America, Portland, OR 97203; Aurora Fine Chemicals LLC, San Diego, CA 92126; Accel Pharmtech, LLC, East Brunswick, NJ 08816; ABI Chem, Munich, Germany; BOC Sciences, Shirley, NY 11967; ChemSampCo, Inc., Dallas, TX 75220; and Reagent World, Inc., Ontario, CA 91761

Typically the dye will be incorporated into the composition in the form of a mixture of reaction products formed by the organic synthesis route used: such a reaction mixture will typically comprise a mixture of the dyes of formula I and often, in addition, reaction products of side reactions and/or minor amounts of unreacted starting materials.

Mixtures of dyes comprising those in which one or more of Q and Q' are not H with dyes in which both Q and Q' are both H are within the scope of this invention. In particular since the dye molecules are ethoxylated, and the alkoxylation reaction produces a distribution of degrees of ethoxylation, the mixture of reaction products will likely include dyes having the formula I but wherein y and/or y' represent the average degree of ethoxylation. Although it may be preferred to remove one or more impurities other than the dyes as defined in formula I, it may not be necessary, so the mixture of reaction products may be used directly in a composition according to the invention. In particular when the dye is formed via the reaction with an anhydride, the regioselectivity of the anhydride ring opening may not be high. Without wishing to be bound by theory, although the most abundant dye present in the mixture may be that produced where the alcohol attacks at the least hindered carbonyl group, the reaction product formed by the attack at the more hindered carbonyl group would likely also be present and has utility. Similarly, it is known by those skilled in the art that ethoxylate chains while often represented as a single length for the sake of simplicity are of course mixtures of a number of different length chains with a distribution around the average length, where the average length is represented by y or y', for example. Furthermore, throughout the lifetime of the laundry care composition interactions of the dye with adjuncts within the composition may result in certain further reaction of the dye compound. One example might be the well known autoxidation of ethoxylate chains when stored in the presence of oxygen, which can lead to the formation of minor impurities. Obviously, impurities due to such well known processes can be reduced or eliminated via a number of equally well known approaches, such as employing reduced temperatures for manufacture, storage and transport, protecting the materials from oxygen, or inclusion of any of a host of



established and often employed primary or secondary antioxidants. When chain processes are involved in such ethoxylate degradation, stabilization strategies will focus on inhibiting the initiation and/or propagation steps, or on promoting chain termination. Common methods for decelerating the initiation step require minimizing or eliminating initiators and/or catalysts from a solid or liquid formulation. The use of colored glass or other colored containers can exclude part or all of the UV/vis spectrum. Metals can be sequestered by the use of chelators. The propagation step of chain processes is best inhibited by so-called "chain-breaking" antioxidants that possess lower reduction potentials compared with the actual substrates. Sterically hindered phenols and secondary aromatic amines are typical examples of primary antioxidant species that can inhibit the propagation step. As an example, hindered phenols form radicals that are relatively inert and do not propagate the chain reaction. Additionally, so-called secondary antioxidants that can react almost stoichiometrically with oxygen or hydroperoxides giving rise to oxidation of their own molecule may also be employed. Examples of secondary oxidation inhibitors are sulphur and/or phosphorus compounds, which contain the heteroatom in a lower valency state, such as thioethers and phosphites. Synergistic combinations of such materials may also be employed to limit unwanted degradation. Some measure of protection from light, chelation of transition metals, and inclusion of low levels (0.0001 – 0.2 wt% in product) of antioxidants like butylated hydroxyl toluene (BHT) is adequate under normal conditions to minimize or eliminate any unwanted degradation of ethoxylate chains. The present invention includes compositions comprising dyes as defined herein optionally in combination with impurities present prior to or after mixing with laundry care adjuncts or on storage or use of a laundry care composition.

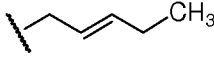
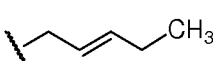
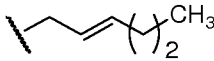
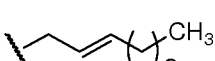
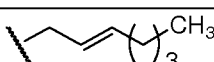
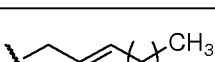
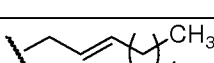
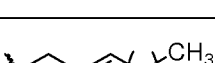
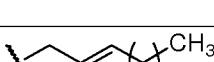
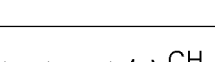
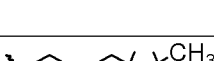

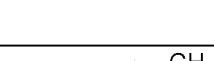
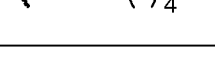
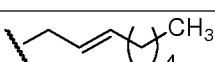
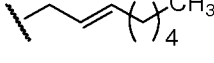
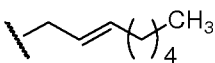
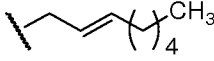
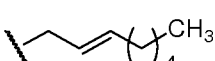
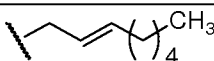
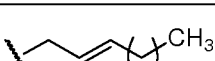
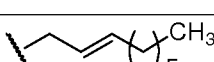
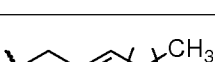
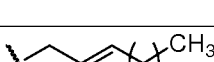
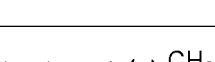
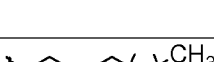
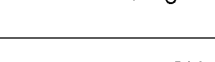
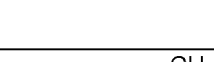
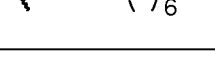
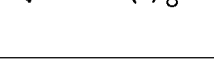
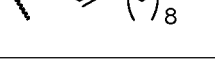
Typically the dye or mixture of dyes of formula I will be present in the composition in an amount from 0.00001 to 5 wt% of the composition, more usually in an amount from 0.0001, or 0.0005 to 1wt% or to 0.5 wt% of the composition.

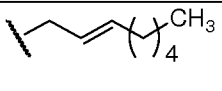
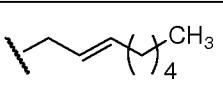
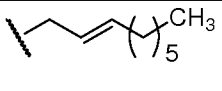
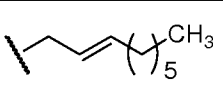
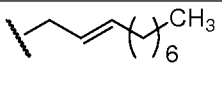
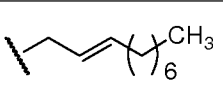
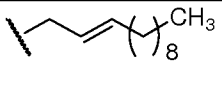
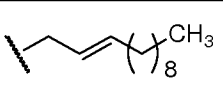
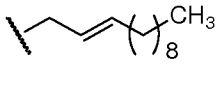
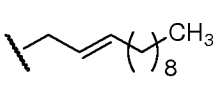
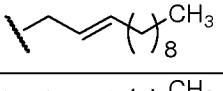
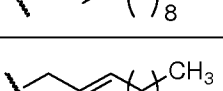
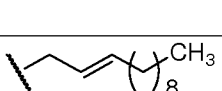
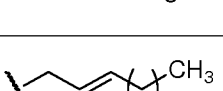
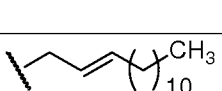
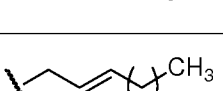
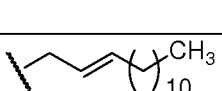
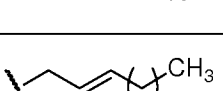
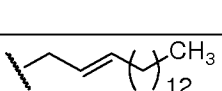
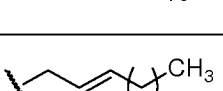
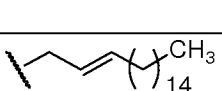
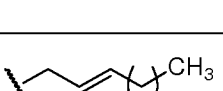
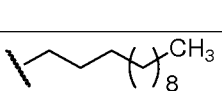
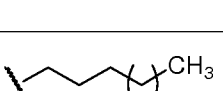
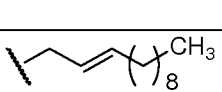
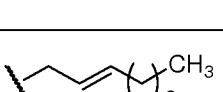
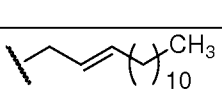
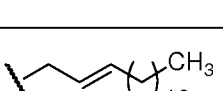
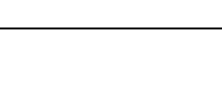
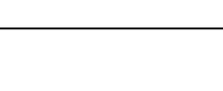
Where the dye is first formed into a pre-mix, for example a particle or concentrated liquid for incorporation into the composition, the dye may be present at a level of from 0.001 or even 0.01 or greater, up to an amount of 2wt% , or 10wt% based on the weight of the pre-mix.

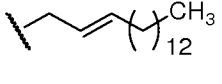
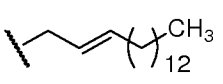
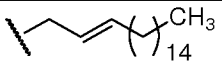
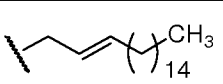
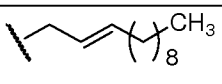
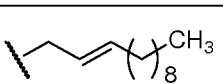
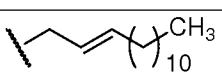
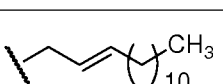
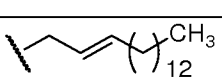
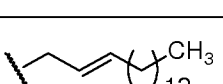
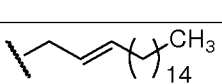
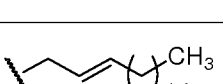
Non-limiting examples of suitable dyes are shown in Table 1.

Table 1: Thiophene Azo Carboxylate Dyes

Ex	R <sup>1</sup>	R <sup>2</sup>							R <sup>3</sup>						
		y	Q	R <sup>2</sup> Y					y'	Q'	R <sup>3</sup> Y				
				m	n	R <sup>4</sup>	R <sup>4</sup>	M			m	n	R <sup>4</sup>	R <sup>4</sup>	M

1	H	5	Y	1	0	H		Na <sup>+</sup>	5	Y	1	0	H		Na <sup>+</sup>
2	H	5	Y	1	0	H		Na <sup>+</sup>	5	Y	1	0	H		Na <sup>+</sup>
3	H	5	Y	1	0	H		Na <sup>+</sup>	5	Y	1	0	H		Na <sup>+</sup>
4	H	5	Y	1	0	H		Na <sup>+</sup>	5	Y	1	0	H		Na <sup>+</sup>
5	Cl	5	Y	1	0	H		Na <sup>+</sup>	5	Y	1	0	H		Na <sup>+</sup>
6	H	5	Y	0	1	H		Na <sup>+</sup>	5	Y	1	0	H		Na <sup>+</sup>
7	H	5	Y	0	1	H		Na <sup>+</sup>	5	Y	0	1	H		Na <sup>+</sup>
8	H	5	H	Not Applicable					5	Y	1	0	H		Na <sup>+</sup>
9	Cl	5	Y	0	1	H		H <sup>+</sup>	5	Y	1	0	H		H <sup>+</sup>
10	H	5	Y	1	0	H		H <sup>+</sup>	5	Y	1	0	H		H <sup>+</sup>
11	H	8	Y	1	0	H		Na <sup>+</sup>	7	Y	1	0	H		Na <sup>+</sup>
12	H	8	Y	1	0	H		Na <sup>+</sup>	7	Y	1	0	H		Na <sup>+</sup>
13	H	8	Y	1	0	H		Na <sup>+</sup>	7	Y	1	0	H		Na <sup>+</sup>
14	Cl	8	Y	1	0	H		Na <sup>+</sup>	7	Y	1	0	H		Na <sup>+</sup>
15	H	8	Y	1	0	H		Na <sup>+</sup>	7	Y	1	0	H		Na <sup>+</sup>
16	Cl	8	Y	1	0	H		Na <sup>+</sup>	7	Y	1	0	H		Na <sup>+</sup>

17	H	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
18	H	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
19	H	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
20	Cl	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
21	H	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
22	Cl	10	H	Not Applicable					10	Y	1	0	H		Na <sup>+</sup>
23	H	10	H	Not Applicable					10	Y	1	0	H		Na <sup>+</sup>
24	Cl	10	Y	0	1	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
25	H	10	Y	0	1	H		Na <sup>+</sup>	10	Y	0	1	H		Na <sup>+</sup>
26	Cl	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
27	H	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
28	Cl	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
29	H	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
30	H	10	Y	1	0	H		Na <sup>+</sup>	10	Y	1	0	H		Na <sup>+</sup>
31	H	15	Y	1	0	H		Na <sup>+</sup>	15	Y	1	0	H		Na <sup>+</sup>
32	H	15	Y	1	0	H		Na <sup>+</sup>	15	Y	1	0	H		Na <sup>+</sup>

33	H	15	Y	1	0	H		Na <sup>+</sup>	15	Y	1	0	H		Na <sup>+</sup>
34	H	15	Y	1	0	H		Na <sup>+</sup>	15	Y	1	0	H		Na <sup>+</sup>
35	H	20	Y	1	0	H		Na <sup>+</sup>	20	Y	1	0	H		Na <sup>+</sup>
36	H	20	Y	1	0	H		Na <sup>+</sup>	20	Y	1	0	H		Na <sup>+</sup>
37	H	20	Y	1	0	H		Na <sup>+</sup>	20	Y	1	0	H		Na <sup>+</sup>
38	H	20	Y	1	0	H		Na <sup>+</sup>	20	Y	1	0	H		Na <sup>+</sup>

#### Laundry Care Adjunct Materials

Suitable adjuncts may be, for example to assist or enhance cleaning performance, for treatment of the substrate to be cleaned, for example by softening or freshening, or to modify the aesthetics of the composition as is the case with perfumes, colorants, non-fabric-shading dyes or the like. Suitable adjunct materials include, but are not limited to, surfactants, builders, chelating agents, dye transfer inhibiting agents, dispersants, enzymes, and enzyme stabilizers, catalytic materials, bleach activators, hydrogen peroxide, sources of hydrogen peroxide, preformed peracids, polymeric dispersing agents, clay soil removal/anti-redeposition agents, brighteners, suds suppressors, dyes, hueing dyes, perfumes, perfume delivery systems, structure elasticizing agents, fabric softeners, carriers, hydrotropes, processing aids, solvents, additional dyes and/or pigments, some of which are discussed in more detail below. In addition to the disclosure below, suitable examples of such other adjuncts and levels of use are found in U.S. Patent Nos. 5,576,282, 6,306,812 B1 and 6,326,348 B1 that are incorporated by reference.

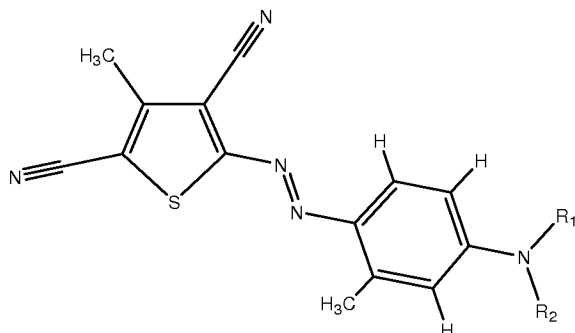
**Additional Fabric Hueing Agents.** Although it is not preferred to incorporate additional fabric shading dyes, in addition to the thiophene azo dye, the composition may comprise one or more additional fabric hueing agents. Suitable fabric hueing agents include dyes, dye-clay conjugates, and pigments. Suitable dyes include those that deposit more onto cotton textiles compared to deposition onto synthetic textiles such as polyester and/or nylon. Further suitable dyes include those that deposit more onto synthetic fibres such as polyester and/or nylon

compared to cotton. Suitable dyes include small molecule dyes and polymeric dyes. Suitable small molecule dyes include small molecule dyes selected from the group consisting of dyes falling into the Colour Index (C.I.) classifications of Direct Blue, Direct Red, Direct Violet, Acid Blue, Acid Red, Acid Violet, Basic Blue, Basic Violet and Basic Red, or mixtures thereof.

5 Examples of small molecule dyes include those selected from the group consisting of Colour Index (Society of Dyers and Colourists, Bradford, UK) numbers Direct Violet 9, Direct Violet 35, Direct Violet 48, Direct Violet 51, Direct Violet 66, Direct Violet 99, Direct Blue 1, Direct Blue 71, Direct Blue 80, Direct Blue 279, Acid Red 17, Acid Red 73, Acid Red 88, Acid Red 150, Acid Violet 15, Acid Violet 17, Acid Violet 24, Acid Violet 43, Acid Red 52, Acid Violet  
10 49, Acid Violet 50, Acid Blue 15, Acid Blue 17, Acid Blue 25, Acid Blue 29, Acid Blue 40, Acid Blue 45, Acid Blue 75, Acid Blue 80, Acid Blue 83, Acid Blue 90 and Acid Blue 113, Acid Black 1, Basic Violet 1, Basic Violet 3, Basic Violet 4, Basic Violet 10, Basic Violet 35, Basic Blue 3, Basic Blue 16, Basic Blue 22, Basic Blue 47, Basic Blue 66, Basic Blue 75, Basic Blue 159, small molecule dyes selected from the group consisting of Colour Index (Society of Dyers  
15 and Colourists, Bradford, UK) numbers Acid Violet 17, Acid Violet 43, Acid Red 52, Acid Red 73, Acid Red 88, Acid Red 150, Acid Blue 25, Acid Blue 29, Acid Blue 45, Acid Blue 113, Acid Black 1, Direct Blue 1, Direct Blue 71. Direct Violet small molecule dyes may be preferred. Dyes selected from the group consisting Acid Violet 17, Direct Blue 71, Direct Violet 51, Direct Blue 1, Acid Red 88, Acid Red 150, Acid Blue 29, Acid Blue 113 and mixtures thereof may be  
20 preferred.

Suitable polymeric dyes include polymeric dyes selected from the group consisting of polymers containing covalently bound chromogens (dye-polymer conjugates) and polymers with chromogens co-polymerized into the backbone of the polymer and mixtures thereof, and polymeric dyes selected from the group consisting of fabric-substantive colorants sold under the  
25 name of Liquitint® (Milliken, Spartanburg, South Carolina, USA), dye-polymer conjugates formed from at least one reactive dye and a polymer selected from the group consisting of polymers comprising a moiety selected from the group consisting of a hydroxyl moiety, a primary amine moiety, a secondary amine moiety, a thiol moiety and mixtures thereof. In still another aspect, suitable polymeric dyes include polymeric dyes selected from the group  
30 consisting of Liquitint® (Milliken, Spartanburg, South Carolina, USA) Violet CT, carboxymethyl cellulose (CMC) conjugated with a reactive blue, reactive violet or reactive red dye such as CMC conjugated with C.I. Reactive Blue 19, sold by Megazyme, Wicklow, Ireland under the product name AZO-CM-CELLULOSE, product code S-ACMC, alkoxyated triphenyl-methane polymeric colourants, alkoxyated thiophene polymeric colourants, and mixtures

thereof. Preferred additional hueing dyes include the whitening agents found in WO 08/87497 A1. These whitening agents may be characterized by the following structure (IV):



(IV)

wherein R<sub>1</sub> and R<sub>2</sub> can independently be selected from: a)  
 5 [(CH<sub>2</sub>CR'HO)<sub>x</sub>(CH<sub>2</sub>CR''HO)<sub>y</sub>H], wherein R' is selected from the group consisting of H, CH<sub>3</sub>, CH<sub>2</sub>O(CH<sub>2</sub>CH<sub>2</sub>O)<sub>z</sub>H, and mixtures thereof; wherein R'' is selected from the group consisting of H, CH<sub>2</sub>O(CH<sub>2</sub>CH<sub>2</sub>O)<sub>z</sub>H, and mixtures thereof; wherein x + y ≤ 5; wherein y ≥ 1; and wherein z = 0 to 5;

b) R<sub>1</sub> = alkyl, aryl or aryl alkyl and R<sub>2</sub> = [(CH<sub>2</sub>CR'HO)<sub>x</sub>(CH<sub>2</sub>CR''HO)<sub>y</sub>H]

10 wherein R' is selected from the group consisting of H, CH<sub>3</sub>, CH<sub>2</sub>O(CH<sub>2</sub>CH<sub>2</sub>O)<sub>z</sub>H, and mixtures thereof; wherein R'' is selected from the group consisting of H, CH<sub>2</sub>O(CH<sub>2</sub>CH<sub>2</sub>O)<sub>z</sub>H, and mixtures thereof; wherein x + y ≤ 10; wherein y ≥ 1; and wherein z = 0 to 5;

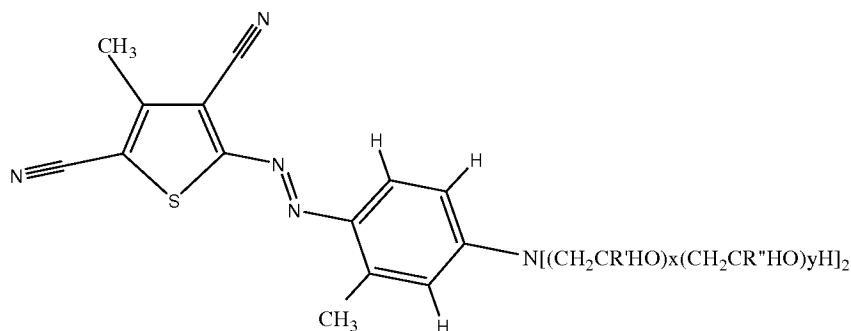
c) R<sub>1</sub> = [CH<sub>2</sub>CH(OR<sub>3</sub>)CH<sub>2</sub>OR<sub>4</sub>] and R<sub>2</sub> = [CH<sub>2</sub>CH(O R<sub>3</sub>)CH<sub>2</sub>O R<sub>4</sub>]

15 wherein R<sub>3</sub> is selected from the group consisting of H, (CH<sub>2</sub>CH<sub>2</sub>O)<sub>z</sub>H, and mixtures thereof; and wherein z = 0 to 10;

wherein R<sub>4</sub> is selected from the group consisting of (C<sub>1</sub>-C<sub>16</sub>)alkyl, aryl groups, and mixtures thereof; and

d) wherein R<sub>1</sub> and R<sub>2</sub> can independently be selected from the amino addition product of styrene oxide, glycidyl methyl ether, isobutyl glycidyl ether, isopropylglycidyl ether, 20 t-butyl glycidyl ether, 2-ethylhexylglycidyl ether, and glycidylhexadecyl ether, followed by the addition of from 1 to 10 alkylene oxide units.

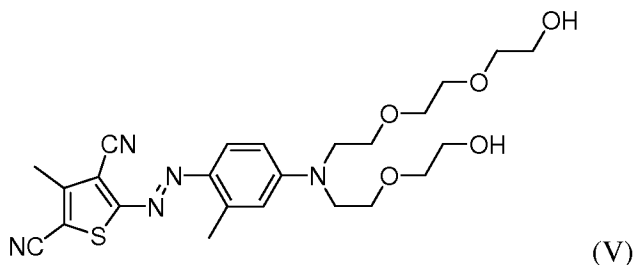
A preferred additional fabric hueing agent which may be incorporated into the compositions of the invention may be characterized by the following structure (IV):



(IV)

wherein R' is selected from the group consisting of H, CH<sub>3</sub>, CH<sub>2</sub>O(CH<sub>2</sub>CH<sub>2</sub>O)<sub>z</sub>H, and mixtures thereof; wherein R'' is selected from the group consisting of H, CH<sub>2</sub>O(CH<sub>2</sub>CH<sub>2</sub>O)<sub>z</sub>H, and mixtures thereof; wherein  $x + y \leq 5$ ; wherein  $y \geq 1$ ; and wherein  $z = 0$  to 5.

A further preferred additional hueing dye may be characterized by the following structure (V):



(V)

This dye is typically a mixture of compounds having an average of 3-10 EO groups, preferably 5 EO groups per molecule.

Further additional shading dyes are those described in USPN 2008 34511 A1 (Unilever). A preferred agent is "Solvent Violet 13".

Suitable dye clay conjugates include dye clay conjugates selected from the group comprising at least one cationic/basic dye and a smectite clay, and mixtures thereof. In another aspect, suitable dye clay conjugates include dye clay conjugates selected from the group consisting of one cationic/basic dye selected from the group consisting of C.I. Basic Yellow 1 through 108, C.I. Basic Orange 1 through 69, C.I. Basic Red 1 through 118, C.I. Basic Violet 1 through 51, C.I. Basic Blue 1 through 164, C.I. Basic Green 1 through 14, C.I. Basic Brown 1

through 23, CI Basic Black 1 through 11, and a clay selected from the group consisting of Montmorillonite clay, Hectorite clay, Saponite clay and mixtures thereof. In still another aspect, suitable dye clay conjugates include dye clay conjugates selected from the group consisting of: Montmorillonite Basic Blue B7 C.I. 42595 conjugate, Montmorillonite Basic Blue B9 C.I. 52015 conjugate, Montmorillonite Basic Violet V3 C.I. 42555 conjugate, Montmorillonite Basic Green G1 C.I. 42040 conjugate, Montmorillonite Basic Red R1 C.I. 45160 conjugate, Montmorillonite C.I. Basic Black 2 conjugate, Hectorite Basic Blue B7 C.I. 42595 conjugate, Hectorite Basic Blue B9 C.I. 52015 conjugate, Hectorite Basic Violet V3 C.I. 42555 conjugate, Hectorite Basic Green G1 C.I. 42040 conjugate, Hectorite Basic Red R1 C.I. 45160 conjugate, Hectorite C.I. Basic Black 2 conjugate, Saponite Basic Blue B7 C.I. 42595 conjugate, Saponite Basic Blue B9 C.I. 52015 conjugate, Saponite Basic Violet V3 C.I. 42555 conjugate, Saponite Basic Green G1 C.I. 42040 conjugate, Saponite Basic Red R1 C.I. 45160 conjugate, Saponite C.I. Basic Black 2 conjugate and mixtures thereof.

Suitable pigments include pigments selected from the group consisting of flavanthrone, indanthrone, chlorinated indanthrone containing from 1 to 4 chlorine atoms, pyranthrone, dichloropyranthrone, monobromodichloropyranthrone, dibromodichloropyranthrone, tetrabromopyranthrone, perylene-3,4,9,10-tetracarboxylic acid diimide, wherein the imide groups may be unsubstituted or substituted by C<sub>1</sub>-C<sub>3</sub> -alkyl or a phenyl or heterocyclic radical, and wherein the phenyl and heterocyclic radicals may additionally carry substituents which do not confer solubility in water, anthrapyrimidinecarboxylic acid amides, violanthrone, isoviolanthrone, dioxazine pigments, copper phthalocyanine which may contain up to 2 chlorine atoms per molecule, polychloro-copper phthalocyanine or polybromochloro-copper phthalocyanine containing up to 14 bromine atoms per molecule and mixtures thereof. Particularly preferred are Pigment Blues 15 to 20, especially Pigment Blue 15 and/or 16. Other suitable pigments include those selected from the group consisting of Ultramarine Blue (C.I. Pigment Blue 29), Ultramarine Violet (C.I. Pigment Violet 15) and mixtures thereof. Suitable hueing agents are described in more detail in US 7,208,459 B2.

**Encapsulates.** The composition may comprise an encapsulate. In one aspect, an encapsulate comprising a core, a shell having an inner and outer surface, said shell encapsulating said core. The core may comprise any laundry care adjunct, though typically the core may comprise material selected from the group consisting of perfumes; brighteners; dyes; insect repellants; silicones; waxes; flavors; vitamins; fabric softening agents; skin care agents in one



aspect, paraffins; enzymes; anti-bacterial agents; bleaches; sensates; and mixtures thereof; and said shell may comprise a material selected from the group consisting of polyethylenes; polyamides; polyvinylalcohols, optionally containing other co-monomers; polystyrenes; polyisoprenes; polycarbonates; polyesters; polyacrylates; aminoplasts, in one aspect said aminoplast may comprise a polyureas, polyurethane, and/or polyureaurethane, in one aspect said polyurea may comprise polyoxymethyleneurea and/or melamine formaldehyde; polyolefins; polysaccharides, in one aspect said polysaccharide may comprise alginate and/or chitosan; gelatin; shellac; epoxy resins; vinyl polymers; water insoluble inorganics; silicone; and mixtures thereof. Preferred encapsulates comprise perfume. Preferred encapsulates comprise a shell which may comprise melamine formaldehyde and/or cross linked melamine formaldehyde. Preferred encapsulates comprise a core material and a shell, said shell at least partially surrounding said core material, is disclosed. At least 75%, 85% or even 90% of said encapsulates may have a fracture strength of from 0.2 MPa to 10 MPa, and a benefit agent leakage of from 0% to 20%, or even less than 10% or 5% based on total initial encapsulated benefit agent. Preferred are those in which at least 75%, 85% or even 90% of said encapsulates may have (i) a particle size of from 1 microns to 80 microns, 5 microns to 60 microns, from 10 microns to 50 microns, or even from 15 microns to 40 microns, and/or (ii) at least 75%, 85% or even 90% of said encapsulates may have a particle wall thickness of from 30 nm to 250 nm, from 80 nm to 180 nm, or even from 100 nm to 160 nm. Formaldehyde scavengers may be employed with the encapsulates, for example, in a capsule slurry and/or added to a composition before, during or after the encapsulates are added to such composition. Suitable capsules that can be made by following the teaching of USPA 2008/0305982 A1; and/or USPA 2009/0247449 A1. Alternatively, suitable capsules can be purchased from Appleton Papers Inc. of Appleton, Wisconsin USA.

In a preferred aspect the composition may comprise a deposition aid, preferably in addition to encapsulates. Preferred deposition aids are selected from the group consisting of cationic and nonionic polymers. Suitable polymers include cationic starches, cationic hydroxyethylcellulose, polyvinylformaldehyde, locust bean gum, mannans, xyloglucans, tamarind gum, polyethyleneterephthalate and polymers containing dimethylaminoethyl methacrylate, optionally with one or more monomers selected from the group comprising acrylic acid and acrylamide.

**Perfume.** Preferred compositions of the invention comprise perfume. Typically the composition comprises a perfume that comprises one or more perfume raw materials, selected

from the group as described in WO08/87497. However, any perfume useful in a laundry care composition may be used. A preferred method of incorporating perfume into the compositions of the invention is via an encapsulated perfume particle comprising either a water-soluble hydroxylic compound or melamine-formaldehyde or modified polyvinyl alcohol. In one aspect the encapsulate comprises (a) an at least partially water-soluble solid matrix comprising one or more water-soluble hydroxylic compounds, preferably starch; and (b) a perfume oil encapsulated by the solid matrix. In a further aspect the perfume may be pre-complexed with a polyamine, preferably a polyethylenimine so as to form a Schiff base.

**Polymers.** The composition may comprise one or more polymers. Examples are optionally modified carboxymethylcellulose, poly(vinyl-pyrrolidone), poly (ethylene glycol), poly(vinyl alcohol), poly(vinylpyridine-N-oxide), poly(vinylimidazole), polycarboxylates such as polyacrylates, maleic/acrylic acid copolymers and lauryl methacrylate/acrylic acid co-polymers.

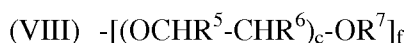
The composition may comprise one or more amphiphilic cleaning polymers such as the compound having the following general structure:  $\text{bis}((\text{C}_2\text{H}_5\text{O})(\text{C}_2\text{H}_4\text{O})_n)(\text{CH}_3)\text{-N}^+\text{-C}_x\text{H}_{2x}\text{-N}^+\text{-(CH}_3\text{)-bis}((\text{C}_2\text{H}_5\text{O})(\text{C}_2\text{H}_4\text{O})_n)$ , wherein  $n =$  from 20 to 30, and  $x =$  from 3 to 8, or sulphated or sulphonated variants thereof. In one aspect, this polymer is sulphated or sulphonated to provide a zwitterionic soil suspension polymer.

The composition preferably comprises amphiphilic alkoxyated grease cleaning polymers which have balanced hydrophilic and hydrophobic properties such that they remove grease particles from fabrics and surfaces. Preferred amphiphilic alkoxyated grease cleaning polymers comprise a core structure and a plurality of alkoxyate groups attached to that core structure. These may comprise alkoxyated polyalkylenimines, preferably having an inner polyethylene oxide block and an outer polypropylene oxide block. Typically these may be incorporated into the compositions of the invention in amounts of from 0.005 to 10 wt%, generally from 0.5 to 8 wt%.

Alkoxyated polycarboxylates such as those prepared from polyacrylates are useful herein to provide additional grease removal performance. Such materials are described in WO 91/08281 and PCT 90/01815. Chemically, these materials comprise polyacrylates having one ethoxy side-chain per every 7-8 acrylate units. The side-chains are of the formula  $\text{-(CH}_2\text{CH}_2\text{O)}_m(\text{CH}_2)_n\text{CH}_3$  wherein  $m$  is 2-3 and  $n$  is 6-12. The side-chains are ester-linked to the polyacrylate "backbone" to provide a "comb" polymer type structure. The molecular weight can vary, but is typically in the range of about 2000 to about 50,000. Such alkoxyated polycarboxylates can comprise from about 0.05% to about 10%, by weight, of the compositions herein.

Mixtures of cosurfactants and other adjunct ingredients, are particularly suited to be used with an amphiphilic graft co-polymer. Preferred amphiphilic graft co-polymer(s) comprise (i) polyethylene glycol backbone; and (ii) and at least one pendant moiety selected from polyvinyl acetate, polyvinyl alcohol and mixtures thereof. A preferred amphiphilic graft co-polymer is Sokalan HP22, supplied from BASF. Suitable polymers include random graft copolymers, preferably a polyvinyl acetate grafted polyethylene oxide copolymer having a polyethylene oxide backbone and multiple polyvinyl acetate side chains. The molecular weight of the polyethylene oxide backbone is preferably about 6000 and the weight ratio of the polyethylene oxide to polyvinyl acetate is about 40 to 60 and no more than 1 grafting point per 50 ethylene oxide units. Typically these are incorporated into the compositions of the invention in amounts from 0.005 to 10 wt%, more usually from 0.05 to 8 wt%. Preferably the composition comprises one or more carboxylate polymer, such as a maleate/acrylate random copolymer or polyacrylate homopolymer. In one aspect, the carboxylate polymer is a polyacrylate homopolymer having a molecular weight of from 4,000 Da to 9,000 Da, or from 6,000 Da to 9,000 Da. Typically these are incorporated into the compositions of the invention in amounts from 0.005 to 10 wt%, or from 0.05 to 8 wt%.

Preferably the composition comprises one or more soil release polymers. Examples include soil release polymers having a structure as defined by one of the following Formulae (VI), (VII) or (VIII):



wherein:

a, b and c are from 1 to 200;

d, e and f are from 1 to 50;

Ar is a 1,4-substituted phenylene;

sAr is 1,3-substituted phenylene substituted in position 5 with SO<sub>3</sub>Me;

Me is Li, K, Mg/2, Ca/2, Al/3, ammonium, mono-, di-, tri-, or tetraalkylammonium

wherein the alkyl groups are C<sub>1</sub>-C<sub>18</sub> alkyl or C<sub>2</sub>-C<sub>10</sub> hydroxyalkyl, or mixtures thereof;

$R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$  and  $R^6$  are independently selected from H or  $C_1$ - $C_{18}$  n- or iso-alkyl; and  $R^7$  is a linear or branched  $C_1$ - $C_{18}$  alkyl, or a linear or branched  $C_2$ - $C_{30}$  alkenyl, or a cycloalkyl group with 5 to 9 carbon atoms, or a  $C_8$ - $C_{30}$  aryl group, or a  $C_6$ - $C_{30}$  arylalkyl group.

Suitable soil release polymers are polyester soil release polymers such as Repel-o-tex polymers, including Repel-o-tex SF, SF-2 and SRP6 supplied by Rhodia. Other suitable soil release polymers include Texcare polymers, including Texcare SRA100, SRA300, SRN100, SRN170, SRN240, SRN300 and SRN325 supplied by Clariant. Other suitable soil release polymers are Marloquest polymers, such as Marloquest SL supplied by Sasol.

Preferably the composition comprises one or more cellulosic polymer, including those selected from alkyl cellulose, alkyl alkoxyalkyl cellulose, carboxyalkyl cellulose, alkyl carboxyalkyl cellulose. Preferred cellulosic polymers are selected from the group comprising carboxymethyl cellulose, methyl cellulose, methyl hydroxyethyl cellulose, methyl carboxymethyl cellulose, and mixtures thereof. In one aspect, the carboxymethyl cellulose has a degree of carboxymethyl substitution from 0.5 to 0.9 and a molecular weight from 100,000 Da to 300,000 Da.

**Enzymes.** Preferably the composition comprises one or more enzymes. Preferred enzymes provide cleaning performance and/or fabric care benefits. Examples of suitable enzymes include, but are not limited to, hemicellulases, peroxidases, proteases, cellulases, xylanases, lipases, phospholipases, esterases, cutinases, pectinases, mannanases, pectate lyases, keratinases, reductases, oxidases, phenoloxidases, lipoxxygenases, ligninases, pullulanases, tannases, pentosanases, malanases,  $\beta$ -glucanases, arabinosidases, hyaluronidase, chondroitinase, laccase, and amylases, or mixtures thereof. A typical combination is an enzyme cocktail that may comprise, for example, a protease and lipase in conjunction with amylase. When present in the composition, the aforementioned additional enzymes may be present at levels from about 0.00001% to about 2%, from about 0.0001% to about 1% or even from about 0.001% to about 0.5% enzyme protein by weight of the composition.

**Proteases.** Preferably the composition comprises one or more proteases. Suitable proteases include metalloproteases and serine proteases, including neutral or alkaline microbial serine proteases, such as subtilisins (EC 3.4.21.62). Suitable proteases include those of animal, vegetable or microbial origin. In one aspect, such suitable protease may be of microbial origin. The suitable proteases include chemically or genetically modified mutants of the aforementioned suitable proteases. In one aspect, the suitable protease may be a serine protease, such as an alkaline microbial protease or/and a trypsin-type protease. Examples of suitable neutral or alkaline proteases include:

(a) subtilisins (EC 3.4.21.62), including those derived from *Bacillus*, such as *Bacillus lentus*, *B. alkalophilus*, *B. subtilis*, *B. amyloliquefaciens*, *Bacillus pumilus* and *Bacillus gibsonii* described in US 6,312,936 B1, US 5,679,630, US 4,760,025, US7,262,042 and WO09/021867.

(b) trypsin-type or chymotrypsin-type proteases, such as trypsin (*e.g.*, of porcine or bovine origin), including the *Fusarium* protease described in WO 89/06270 and the chymotrypsin proteases derived from *Cellulomonas* described in WO 05/052161 and WO 05/052146.

(c) metalloproteases, including those derived from *Bacillus amyloliquefaciens* described in WO 07/044993A2.

Preferred proteases include those derived from *Bacillus gibsonii* or *Bacillus Lentus*.

Suitable commercially available protease enzymes include those sold under the trade names Alcalase®, Savinase®, Primase®, Durazym®, Polarzyme®, Kannase®, Liqueanase®, Liqueanase Ultra®, Savinase Ultra®, Ovozyme®, Neutrase®, Everlase® and Esperase® by Novozymes A/S (Denmark), those sold under the tradename Maxatase®, Maxacal®, Maxapem®, Properase®, Purafect®, Purafect Prime®, Purafect Ox®, FN3®, FN4®, Excellase® and Purafect OXP® by Genencor International, those sold under the tradename Opticlean® and Optimase® by Solvay Enzymes, those available from Henkel/ Kemira, namely BLAP (sequence shown in Figure 29 of US 5,352,604 with the following mutations S99D + S101 R + S103A + V104I + G159S, hereinafter referred to as BLAP), BLAP R (BLAP with S3T + V4I + V199M + V205I + L217D), BLAP X (BLAP with S3T + V4I + V205I) and BLAP F49 (BLAP with S3T + V4I + A194P + V199M + V205I + L217D) - all from Henkel/Kemira; and KAP (*Bacillus alkalophilus subtilisin* with mutations A230V + S256G + S259N) from Kao.

**Amylases.** Preferably the composition may comprise an amylase. Suitable alpha-amylases include those of bacterial or fungal origin. Chemically or genetically modified mutants (variants) are included. A preferred alkaline alpha-amylase is derived from a strain of *Bacillus*, such as *Bacillus licheniformis*, *Bacillus amyloliquefaciens*, *Bacillus stearothermophilus*, *Bacillus subtilis*, or other *Bacillus sp.*, such as *Bacillus sp.* NCIB 12289, NCIB 12512, NCIB 12513, DSM 9375 (USP 7,153,818) DSM 12368, DSMZ no. 12649, KSM AP1378 (WO 97/00324), KSM K36 or KSM K38 (EP 1,022,334). Preferred amylases include:

(a) the variants described in WO 94/02597, WO 94/18314, WO96/23874 and WO 97/43424, especially the variants with substitutions in one or more of the following positions versus the enzyme listed as SEQ ID No. 2 in WO 96/23874: 15, 23, 105, 106, 124, 128, 133, 154, 156, 181, 188, 190, 197, 202, 208, 209, 243, 264, 304, 305, 391, 408, and 444.

(b) the variants described in USP 5,856,164 and WO99/23211, WO 96/23873, WO00/60060 and WO 06/002643, especially the variants with one or more substitutions in the following positions versus the AA560 enzyme listed as SEQ ID No. 12 in WO 06/002643:

26, 30, 33, 82, 37, 106, 118, 128, 133, 149, 150, 160, 178, 182, 186, 193, 203, 214, 231,  
5 256, 257, 258, 269, 270, 272, 283, 295, 296, 298, 299, 303, 304, 305, 311, 314, 315, 318, 319,  
339, 345, 361, 378, 383, 419, 421, 437, 441, 444, 445, 446, 447, 450, 461, 471, 482, 484,  
preferably that also contain the deletions of D183\* and G184\*.

(c) variants exhibiting at least 90% identity with SEQ ID No. 4 in WO06/002643, the wild-type enzyme from *Bacillus SP722*, especially variants with deletions in the 183 and 184  
10 positions and variants described in WO 00/60060, which is incorporated herein by reference.

(d) variants exhibiting at least 95% identity with the wild-type enzyme from *Bacillus sp.707* (SEQ ID NO:7 in US 6,093, 562), especially those comprising one or more of the following mutations M202, M208, S255, R172, and/or M261. Preferably said amylase comprises one or more of M202L, M202V, M202S, M202T, M202I, M202Q, M202W, S255N and/or  
15 R172Q. Particularly preferred are those comprising the M202L or M202T mutations.

(e) variants described in WO 09/149130, preferably those exhibiting at least 90% identity with SEQ ID NO: 1 or SEQ ID NO:2 in WO 09/149130, the wild-type enzyme from *Geobacillus Stearothermophilus* or a truncated version thereof.

Suitable commercially available alpha-amylases include DURAMYL®, LIQUEZYME®,  
20 TERMAMYL®, TERMAMYL ULTRA®, NATALASE®, SUPRAMYL®, STAINZYME®, STAINZYME PLUS®, FUNGAMYL® and BAN® (Novozymes A/S, Bagsvaerd, Denmark), KEMZYM® AT 9000 Biozym Biotech Trading GmbH Wehlstrasse 27b A-1200 Wien Austria, RAPIDASE® , PURASTAR®, ENZYSIZE®, OPTISIZE HT PLUS®, POWERASE® and PURASTAR OXAM® (Genencor International Inc., Palo Alto, California) and KAM® (Kao,  
25 14-10 Nihonbashi Kayabacho, 1-chome, Chuo-ku Tokyo 103-8210, Japan). In one aspect, suitable amylases include NATALASE®, STAINZYME® and STAINZYME PLUS® and mixtures thereof.

**Lipases.** Preferably the invention comprises one or more lipases, including “first cycle lipases” such as those described in U.S. Patent 6,939,702 B1 and US PA 2009/0217464.  
30 Preferred lipases are first-wash lipases. In one embodiment of the invention the composition comprises a first wash lipase. First wash lipases includes a lipase which is a polypeptide having an amino acid sequence which: (a) has at least 90% identity with the wild-type lipase derived from *Humicola lanuginosa* strain DSM 4109; (b) compared to said wild-type lipase, comprises a substitution of an electrically neutral or negatively charged amino acid at the surface of the three-

dimensional structure within 15A of E1 or Q249 with a positively charged amino acid; and (c) comprises a peptide addition at the C-terminal; and/or (d) comprises a peptide addition at the N-terminal and/or (e) meets the following limitations: i) comprises a negative amino acid in position E210 of said wild-type lipase; ii) comprises a negatively charged amino acid in the region corresponding to positions 90-101 of said wild-type lipase; and iii) comprises a neutral or negative amino acid at a position corresponding to N94 or said wild-type lipase and/or has a negative or neutral net electric charge in the region corresponding to positions 90-101 of said wild-type lipase. Preferred are variants of the wild-type lipase from *Thermomyces lanuginosus* comprising one or more of the T231R and N233R mutations. The wild-type sequence is the 269 amino acids (amino acids 23 – 291) of the Swissprot accession number Swiss-Prot O59952 (derived from *Thermomyces lanuginosus* (*Humicola lanuginosa*)). Preferred lipases would include those sold under the tradenames Lipex® and Lipolex® and Lipoclean®.

**Endoglucanases.** Other preferred enzymes include microbial-derived endoglucanases exhibiting endo-beta-1,4-glucanase activity (E.C. 3.2.1.4), including a bacterial polypeptide endogenous to a member of the genus *Bacillus* which has a sequence of at least 90%, 94%, 97% and even 99% identity to the amino acid sequence SEQ ID NO:2 in US7,141,403B2) and mixtures thereof. Suitable endoglucanases are sold under the tradenames Celluclean® and Whitezyme® (Novozymes A/S, Bagsvaerd, Denmark).

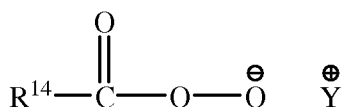
**Pectate Lyases.** Other preferred enzymes include pectate lyases sold under the tradenames Pectawash®, Pectaway®, Xpect® and mannanases sold under the tradenames Mannaway® (all from Novozymes A/S, Bagsvaerd, Denmark), and Purabrite® (Genencor International Inc., Palo Alto, California).

**Bleaching Agents.** It may be preferred for the composition to comprise one or more bleaching agents. Suitable bleaching agents other than bleaching catalysts include photobleaches, bleach activators, hydrogen peroxide, sources of hydrogen peroxide, pre-formed peracids and mixtures thereof. In general, when a bleaching agent is used, the compositions of the present invention may comprise from about 0.1% to about 50% or even from about 0.1% to about 25% bleaching agent or mixtures of bleaching agents by weight of the subject composition. Examples of suitable bleaching agents include:

- (1) photobleaches for example sulfonated zinc phthalocyanine sulfonated aluminium phthalocyanines, xanthene dyes and mixtures thereof;
- (2) pre-formed peracids: Suitable preformed peracids include, but are not limited to compounds selected from the group consisting of pre-formed peroxyacids or salts thereof typically a percarboxylic acids and salts, percarbonic acids and salts, perimidic acids and salts,

peroxymonosulfuric acids and salts, for example, Oxone®, and mixtures thereof. Suitable examples include peroxycarboxylic acids or salts thereof, or peroxysulphonic acids or salts thereof. Typical peroxycarboxylic acid salts suitable for use herein have a chemical structure corresponding to the following chemical formula:

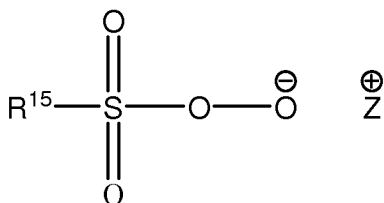
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wherein: R<sup>14</sup> is selected from alkyl, aralkyl, cycloalkyl, aryl or heterocyclic groups; the R<sup>14</sup> group can be linear or branched, substituted or unsubstituted; having, when the peracid is hydrophobic, from 6 to 14 carbon atoms, or from 8 to 12 carbon atoms and, when the peracid is hydrophilic, less than 6 carbon atoms or even less than 4 carbon atoms and Y is any suitable counter-ion that achieves electric charge neutrality, preferably Y is selected from hydrogen, sodium or potassium. Preferably, R<sup>14</sup> is a linear or branched, substituted or unsubstituted C<sub>6-9</sub> alkyl. Preferably, the peroxyacid or salt thereof is selected from peroxyhexanoic acid, peroxyheptanoic acid, peroxyoctanoic acid, peroxynonanoic acid, peroxydecanoic acid, any salt thereof, or any combination thereof. Particularly preferred peroxyacids are phthalimido-peroxy-alkanoic acids, in particular ε-phthalimido peroxy hexanoic acid (PAP). Preferably, the peroxyacid or salt thereof has a melting point in the range of from 30°C to 60°C.

The pre-formed peroxyacid or salt thereof can also be a peroxysulphonic acid or salt thereof, typically having a chemical structure corresponding to the following chemical formula:

20



wherein: R<sup>15</sup> is selected from alkyl, aralkyl, cycloalkyl, aryl or heterocyclic groups; the R<sup>15</sup> group can be linear or branched, substituted or unsubstituted; and Z is any suitable counter-ion that achieves electric charge neutrality, preferably Z is selected from hydrogen, sodium or potassium. Preferably R<sup>15</sup> is a linear or branched, substituted or unsubstituted C<sub>4-14</sub>, preferably C<sub>6-14</sub> alkyl. Preferably such bleach components may be present in the compositions of the invention in an amount from 0.01 to 50%, most preferably from 0.1% to 20%.

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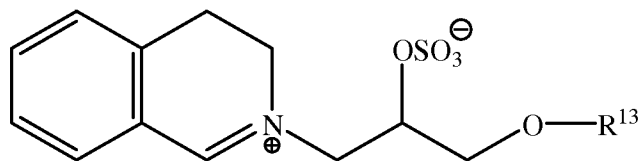
(3) sources of hydrogen peroxide, for example, inorganic perhydrate salts, including alkali metal salts such as sodium salts of perborate (usually mono- or tetra-hydrate), percarbonate, persulphate, perphosphate, persilicate salts and mixtures thereof. In one aspect of the invention the inorganic perhydrate salts are selected from the group consisting of sodium salts of perborate, percarbonate and mixtures thereof. When employed, inorganic perhydrate salts are typically present in amounts of from 0.05 to 40 wt%, or 1 to 30 wt% of the overall fabric and home care product and are typically incorporated into such fabric and home care products as a crystalline solid that may be coated. Suitable coatings include, inorganic salts such as alkali metal silicate, carbonate or borate salts or mixtures thereof, or organic materials such as water-soluble or dispersible polymers, waxes, oils or fatty soaps; and

(4) bleach activators having  $R-(C=O)-L$  wherein R is an alkyl group, optionally branched, having, when the bleach activator is hydrophobic, from 6 to 14 carbon atoms, or from 8 to 12 carbon atoms and, when the bleach activator is hydrophilic, less than 6 carbon atoms or even less than 4 carbon atoms; and L is leaving group. Examples of suitable leaving groups are benzoic acid and derivatives thereof - especially benzene sulphonate. Suitable bleach activators include dodecanoyl oxybenzene sulphonate, decanoyl oxybenzene sulphonate, decanoyl oxybenzoic acid or salts thereof, 3,5,5-trimethyl hexanoyloxybenzene sulphonate, tetraacetyl ethylene diamine (TAED) and nonanoyloxybenzene sulphonate (NOBS). Suitable bleach activators are also disclosed in WO 98/17767. While any suitable bleach activator may be employed, in one aspect of the invention the subject composition may comprise NOBS, TAED or mixtures thereof.

(5) Bleach Catalysts. The compositions of the present invention may also include one or more bleach catalysts capable of accepting an oxygen atom from a peroxyacid and/or salt thereof, and transferring the oxygen atom to an oxidizable substrate. Suitable bleach catalysts include, but are not limited to: iminium cations and polyions; iminium zwitterions; modified amines; modified amine oxides; N-sulphonyl imines; N-phosphonyl imines; N-acyl imines; thiadiazole dioxides; perfluoroimines; cyclic sugar ketones and alpha amino-ketones and mixtures thereof. Suitable alpha amino ketones are for example as described in WO 2012/000846 A1, WO 2008/015443 A1, and WO 2008/014965 A1. Suitable mixtures are as described in USPA 2007/0173430 A1.

Without wishing to be bound by theory, the inventors believe that controlling the electrophilicity and hydrophobicity in this above described manner enables the bleach ingredient to be delivered substantially only to areas of the fabric that are more hydrophobic, and that contain electron rich soils, including visible chromophores, that are susceptible to bleaching by highly electrophilic oxidants.

In one aspect, the bleach catalyst has a structure corresponding to general formula below:



wherein  $R^{13}$  is selected from the group consisting of 2-ethylhexyl, 2-propylheptyl, 2-butyloctyl, 2-pentylonyl, 2-hexyldecyl, n-dodecyl, n-tetradecyl, n-hexadecyl, n-octadecyl, isononyl, iso-decyl, iso-tridecyl and iso-pentadecyl;

(6) The composition may preferably comprise catalytic metal complexes. One preferred type of metal-containing bleach catalyst is a catalyst system comprising a transition metal cation of defined bleach catalytic activity, such as copper, iron, titanium, ruthenium, tungsten, molybdenum, or manganese cations, an auxiliary metal cation having little or no bleach catalytic activity, such as zinc or aluminum cations, and a sequester having defined stability constants for the catalytic and auxiliary metal cations, particularly ethylenediaminetetraacetic acid, ethylenediaminetetra(methylenephosphonic acid) and water-soluble salts thereof. Such catalysts are disclosed in U.S. 4,430,243.

If desired, the compositions herein can be catalyzed by means of a manganese compound. Such compounds and levels of use are well known in the art and include, for example, the manganese-based catalysts disclosed in U.S. 5,576,282.

Cobalt bleach catalysts useful herein are known, and are described, for example, in U.S. 5,597,936; U.S. 5,595,967. Such cobalt catalysts are readily prepared by known procedures, such as taught for example in U.S. 5,597,936, and U.S. 5,595,967.

Compositions herein may also suitably include a transition metal complex of ligands such as bispidones (WO 05/042532 A1) and/or macropolycyclic rigid ligands - abbreviated as "MRLs". As a practical matter, and not by way of limitation, the compositions and processes herein can be adjusted to provide on the order of at least one part per hundred million of the active MRL species in the aqueous washing medium, and will typically provide from about 0.005 ppm to about 25 ppm, from about 0.05 ppm to about 10 ppm, or even from about 0.1 ppm to about 5 ppm, of the MRL in the wash liquor.

Suitable transition-metals in the instant transition-metal bleach catalyst include, for example, manganese, iron and chromium. Suitable MRLs include 5,12-diethyl-1,5,8,12-tetraazabicyclo[6.6.2]hexadecane.

Suitable transition metal MRLs are readily prepared by known procedures, such as taught for example in WO 00/32601, and U.S. 6,225,464.

When present, the source of hydrogen peroxide/peracid and/or bleach activator is generally present in the composition in an amount of from about 0.1 to about 60 wt%, from about 5 0.5 to about 40 wt % or even from about 0.6 to about 10 wt% based on the fabric and home care product. One or more hydrophobic peracids or precursors thereof may be used in combination with one or more hydrophilic peracid or precursor thereof.

Typically hydrogen peroxide source and bleach activator will be incorporated together. The amounts of hydrogen peroxide source and peracid or bleach activator may be selected such 10 that the molar ratio of available oxygen (from the peroxide source) to peracid is from 1:1 to 35:1, or even 2:1 to 10:1.

**Surfactant.** Preferably the composition comprises a surfactant or surfactant system. The surfactant can be selected from nonionic, anionic, cationic, amphoteric, ampholytic, amphiphilic, zwitterionic, semi-polar nonionic surfactants and mixtures thereof. Preferred compositions 15 comprise a mixture of surfactants/surfactant system. Preferred surfactant systems comprise one or more anionic surfactants, most preferably in combination with a co-surfactant, most preferably a nonionic and/or amphoteric and/or zwitterionic surfactant. Preferred surfactant systems comprise both anionic and nonionic surfactant, preferably in weight ratios from 90:1 to 1:90. In some instances a weight ratio of anionic to nonionic surfactant of at least 1:1 is preferred. 20 However a ratio below 10:1 may be preferred. When present, the total surfactant level is preferably from 0.1% to 60%, from 1% to 50% or even from 5% to 40% by weight of the subject composition.

Preferably the composition comprises an anionic deterative surfactant, preferably sulphate and/or sulphonate surfactants. Preferred examples include alkyl benzene sulphonates, alkyl 25 sulphates and alkyl alkoxylated sulphates. Preferred sulphonates are C<sub>10-13</sub> alkyl benzene sulphonate. Suitable alkyl benzene sulphonate (LAS) may be obtained, by sulphonating commercially available linear alkyl benzene (LAB); suitable LAB includes low 2-phenyl LAB, such as those supplied by Sasol under the tradename Isochem® or those supplied by Petresa under the tradename Petrelab®, other suitable LAB include high 2-phenyl LAB, such as those 30 supplied by Sasol under the tradename Hyblene®. A suitable anionic deterative surfactant is alkyl benzene sulphonate that is obtained by DETAL catalyzed process, although other synthesis routes, such as HF, may also be suitable. In one aspect a magnesium salt of LAS is used.

Preferred sulphate deterative surfactants include alkyl sulphate, typically C<sub>8-18</sub> alkyl sulphate, or predominantly C<sub>12</sub> alkyl sulphate. A further preferred alkyl sulphate is alkyl

alkoxylated sulphate, preferably a C<sub>8-18</sub> alkyl alkoxylated sulphate. Preferably the alkoxylating group is an ethoxylating group. Typically the alkyl alkoxylated sulphate has an average degree of alkoxylation of from 0.5 to 30 or 20, or from 0.5 to 10. Particularly preferred are C<sub>8-18</sub> alkyl ethoxylated sulphate having an average degree of ethoxylation of from 0.5 to 10, from 0.5 to 7, from 0.5 to 5 or even from 0.5 to 3.

The alkyl sulphate, alkyl alkoxylated sulphate and alkyl benzene sulphonates may be linear or branched, substituted or un-substituted. When the surfactant is branched, preferably the surfactant will comprise a mid-chain branched sulphate or sulphonate surfactant. Preferably the branching groups comprise C<sub>1-4</sub> alkyl groups, typically methyl and/or ethyl groups.

Preferably the composition comprises a nonionic deterative surfactant. Suitable non-ionic surfactants are selected from the group consisting of: C<sub>8-18</sub> alkyl ethoxylates, such as, NEODOL® non-ionic surfactants from Shell; C<sub>6-12</sub> alkyl phenol alkoxylates wherein the alkoxylate units may be ethyleneoxy units, propyleneoxy units or a mixture thereof; C<sub>12-18</sub> alcohol and C<sub>6-12</sub> alkyl phenol condensates with ethylene oxide/propylene oxide block polymers such as Pluronic® from BASF; C<sub>14-22</sub> mid-chain branched alcohols; C<sub>14-22</sub> mid-chain branched alkyl alkoxylates, typically having an average degree of alkoxylation of from 1 to 30; alkylpolysaccharides, in one aspect, alkylpolyglycosides; polyhydroxy fatty acid amides; ether capped poly(oxyalkylated) alcohol surfactants; and mixtures thereof.

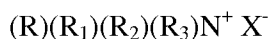
Suitable non-ionic deterative surfactants include alkyl polyglucoside and/or an alkyl alkoxylated alcohol.

In one aspect, non-ionic deterative surfactants include alkyl alkoxylated alcohols, in one aspect C<sub>8-18</sub> alkyl alkoxylated alcohol, for example a C<sub>8-18</sub> alkyl ethoxylated alcohol, the alkyl alkoxylated alcohol may have an average degree of alkoxylation of from 1 to 80, preferably from 1 to 50, most preferably from 1 to 30, from 1 to 20, or from 1 to 10. In one aspect, the alkyl alkoxylated alcohol may be a C<sub>8-18</sub> alkyl ethoxylated alcohol having an average degree of ethoxylation of from 1 to 10, from 1 to 7, more from 1 to 5 or from 3 to 7, or even below 3 or 2. The alkyl alkoxylated alcohol can be linear or branched, and substituted or un-substituted.

Suitable nonionic surfactants include those with the tradename Lutensol® from BASF.

Suitable cationic deterative surfactants include alkyl pyridinium compounds, alkyl quaternary ammonium compounds, alkyl quaternary phosphonium compounds, alkyl ternary sulphonium compounds, and mixtures thereof.

Suitable cationic deterative surfactants are quaternary ammonium compounds having the general formula:



wherein, R is a linear or branched, substituted or unsubstituted C<sub>6-18</sub> alkyl or alkenyl moiety, R<sub>1</sub> and R<sub>2</sub> are independently selected from methyl or ethyl moieties, R<sub>3</sub> is a hydroxyl, hydroxymethyl or a hydroxyethyl moiety, X is an anion which provides charge neutrality, suitable anions include: halides, for example chloride; sulphate; and sulphonate. Suitable cationic deterative surfactants are mono-C<sub>6-18</sub> alkyl mono-hydroxyethyl di-methyl quaternary ammonium chlorides. Highly suitable cationic deterative surfactants are mono-C<sub>8-10</sub> alkyl mono-hydroxyethyl di-methyl quaternary ammonium chloride, mono-C<sub>10-12</sub> alkyl mono-hydroxyethyl di-methyl quaternary ammonium chloride and mono-C<sub>10</sub> alkyl mono-hydroxyethyl di-methyl quaternary ammonium chloride.

Suitable amphoteric/zwitterionic surfactants include amine oxides and betaines.

Amine-neutralized anionic surfactants - Anionic surfactants of the present invention and adjunct anionic cosurfactants, may exist in an acid form, and said acid form may be neutralized to form a surfactant salt which is desirable for use in the present detergent compositions. Typical agents for neutralization include the metal counterion base such as hydroxides, eg, NaOH or KOH. Further preferred agents for neutralizing anionic surfactants of the present invention and adjunct anionic surfactants or cosurfactants in their acid forms include ammonia, amines, or alkanolamines. Alkanolamines are preferred. Suitable non-limiting examples including monoethanolamine, diethanolamine, triethanolamine, and other linear or branched alkanolamines known in the art; for example, highly preferred alkanolamines include 2-amino-1-propanol, 1-aminopropanol, monoisopropanolamine, or 1-amino-3-propanol. Amine neutralization may be done to a full or partial extent, e.g. part of the anionic surfactant mix may be neutralized with sodium or potassium and part of the anionic surfactant mix may be neutralized with amines or alkanolamines.

**Builders.** Preferably the composition comprises one or more builders or a builder system. When a builder is used, the composition of the invention will typically comprise at least 1%, from 2% to 60% builder. It may be preferred that the composition comprises low levels of phosphate salt and/or zeolite, for example from 1 to 10 or 5 wt%. The composition may even be substantially free of strong builder; substantially free of strong builder means "no deliberately added" zeolite and/or phosphate. Typical zeolite builders include zeolite A, zeolite P and zeolite MAP. A typical phosphate builder is sodium tri-polyphosphate.

**Chelating Agent.** Preferably the composition comprises chelating agents and/or crystal growth inhibitor. Suitable molecules include copper, iron and/or manganese chelating agents and mixtures thereof. Suitable molecules include aminocarboxylates, aminophosphonates, succinates, salts thereof, and mixtures thereof. Non-limiting examples of suitable chelants for use

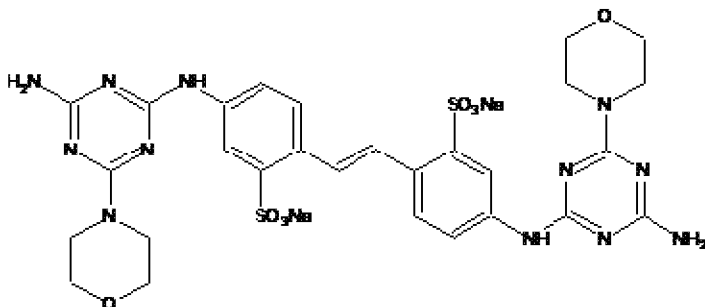
herein include ethylenediaminetetracetates, N- (hydroxyethyl)ethylenediaminetriacetates, nitrilotriacetates, ethylenediamine tetrapropionates, triethylenetetraaminehexacetates, diethylenetriamine-pentaacetates, ethanoldiglycines, ethylenediaminetetrakis (methylenephosphonates), diethylenetriamine penta(methylene phosphonic acid) (DTPMP),  
 5 ethylenediamine disuccinate (EDDS), hydroxyethanedimethylenephosphonic acid (HEDP), methylglycinediacetic acid (MGDA), diethylenetriaminepentaacetic acid (DTPA), salts thereof, and mixtures thereof. Other nonlimiting examples of chelants of use in the present invention are found in U.S. Patent Nos. 7445644, 7585376 and 2009/0176684A1. Other suitable chelating agents for use herein are the commercial DEQUEST series, and chelants from Monsanto,  
 10 DuPont, and Nalco, Inc.

**Dye Transfer Inhibitor (DTI).** The composition may comprise one or more dye transfer inhibiting agents. In one embodiment of the invention the inventors have surprisingly found that compositions comprising polymeric dye transfer inhibiting agents in addition to the specified dye give improved performance. This is surprising because these polymers prevent dye deposition.  
 15 Suitable dye transfer inhibitors include, but are not limited to, polyvinylpyrrolidone polymers, polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, polyvinylloxazolidones and polyvinylimidazoles or mixtures thereof. Suitable examples include PVP-K15, PVP-K30, ChromaBond S-400, ChromaBond S-403E and Chromabond S-100 from Ashland Aqualon, and Sokalan HP165, Sokalan HP50, Sokalan HP53, Sokalan HP59, Sokalan®  
 20 HP 56K , Sokalan® HP 66 from BASF. Other suitable DTIs are as described in WO2012/004134. When present in a subject composition, the dye transfer inhibiting agents may be present at levels from about 0.0001% to about 10%, from about 0.01% to about 5% or even from about 0.1% to about 3% by weight of the composition.

**Fluorescent Brightener.** Preferably the composition comprises one or more fluorescent  
 25 brightener. Commercial optical brighteners which may be useful in the present invention can be classified into subgroups, which include, but are not limited to, derivatives of stilbene, pyrazoline, coumarin, carboxylic acid, methinecyanines, dibenzothiophene-5,5-dioxide, azoles, 5- and 6-membered-ring heterocycles, and other miscellaneous agents. Particularly preferred brighteners are selected from: sodium 2 (4-styryl-3-sulfophenyl) -2H-naphthol [1 , 2-d] triazole,  
 30 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-sulfostyryl) biphenyl. Other examples of such brighteners are disclosed in "The Production and Application of Fluorescent Brightening Agents", M. Zahradnik, Published by John Wiley & Sons, New York (1982).

Specific nonlimiting examples of optical brighteners which are useful in the present compositions are those identified in U.S. Pat. No. 4,790,856 and U.S. Pat. No. 3,646,015.

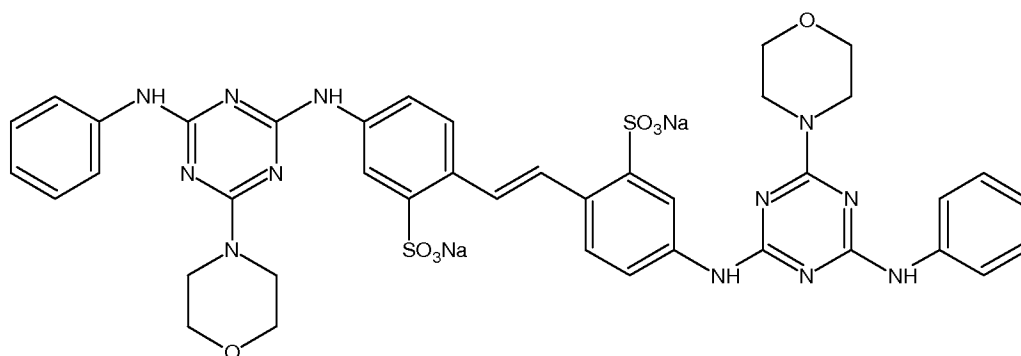
A preferred brightener has the structure below:



5 Suitable fluorescent brightener levels include lower levels of from about 0.01, from about 0.05, from about 0.1 or even from about 0.2 wt % to upper levels of 0.5 or even 0.75 wt %.

In one aspect the brightener may be loaded onto a clay to form a particle.

Preferred brighteners are totally or predominantly (typically at least 50wt%, at least 75wt%, at least 90wt%, at least 99wt%), in alpha-crystalline form. A highly preferred  
10 brightener comprises C.I. fluorescent brightener 260, preferably having the following structure:



This can be particularly useful as it dissolves well in cold water, for example below 30 or  
15 25 or even 20°C.

Preferably brighteners are incorporated in the composition in micronized particulate form, most preferably having a weight average primary particle size of from 3 to 30 micrometers, from 3 micrometers to 20 micrometers, or from 3 to 10 micrometers.

The composition may comprise C.I. fluorescent brightener 260 in beta-crystalline form, and the weight ratio of: (i) C.I. fluorescent brightener 260 in alpha-crystalline form, to (ii) C.I. fluorescent brightener 260 in beta-crystalline form may be at least 0.1, or at least 0.6.  
20

BE680847 relates to a process for making C.I fluorescent brightener 260 in alpha-crystalline form.

**Silicate Salts.** The composition may preferably also contain silicate salts, such as sodium or potassium silicate. The composition may comprise from 0wt% to less than 10wt% silicate salt, to 9wt%, or to 8wt%, or to 7wt%, or to 6wt%, or to 5wt%, or to 4wt%, or to 3wt%, or even to 2wt%, and preferably from above 0wt%, or from 0.5wt%, or even from 1wt% silicate salt. A suitable silicate salt is sodium silicate.

**Dispersants.** The composition may preferably also contain dispersants. Suitable water-soluble organic materials include the homo- or co-polymeric acids or their salts, in which the polycarboxylic acid comprises at least two carboxyl radicals separated from each other by not more than two carbon atoms.

**Enzyme Stabilisers.** The composition may preferably comprise enzyme stabilizers. Any conventional enzyme stabilizer may be used, for example by the presence of water-soluble sources of calcium and/or magnesium ions in the finished fabric and home care products that provide such ions to the enzymes. In case of aqueous compositions comprising protease, a reversible protease inhibitor, such as a boron compound including borate, or preferably 4-formyl phenylboronic acid, phenylboronic acid and derivatives thereof, or compounds such as calcium formate, sodium formate and 1,2-propane diol can be added to further improve stability.

**Solvent System.** The solvent system in the present compositions can be a solvent system containing water alone or mixtures of organic solvents either without or preferably with water. Preferred organic solvents include 1,2-propanediol, ethanol, glycerol, dipropylene glycol, methyl propane diol and mixtures thereof. Other lower alcohols, C1-C4 alkanolamines such as monoethanolamine and triethanolamine, can also be used. Solvent systems can be absent, for example from anhydrous solid embodiments of the invention, but more typically are present at levels in the range of from about 0.1% to about 98%, preferably at least about 1% to about 50%, more usually from about 5% to about 25%.

In some embodiments of the invention, the composition is in the form of a structured liquid. Such structured liquids can either be internally structured, whereby the structure is formed by primary ingredients (e.g. surfactant material) and/or externally structured by providing a three dimensional matrix structure using secondary ingredients (e.g. polymers, clay and/or silicate material), for use e.g. as thickeners. The composition may comprise a structurant, preferably from 0.01wt% to 5wt%, from 0.1wt% to 2.0wt% structurant. Examples of suitable structurants are given in US2006/0205631A1, US2005/0203213A1, US7294611, US6855680. The structurant is typically selected from the group consisting of diglycerides and triglycerides, ethylene glycol distearate, microcrystalline cellulose, cellulose-based materials, microfiber cellulose, hydrophobically modified alkali-swellaable emulsions such as Polygel W30 (3VSigma),



biopolymers, xanthan gum, gellan gum, hydrogenated castor oil, derivatives of hydrogenated castor oil such as non-ethoxylated derivatives thereof and mixtures thereof, in particular, those selected from the group of hydrogenated castor oil, derivatives of hydrogenated castor oil, microfibrillar cellulose, hydroxyfunctional crystalline materials, long chain fatty alcohols, 12-hydroxystearic acids, clays and mixtures thereof. A preferred structurant is described in . US Patent No. 6,855,680 which defines suitable hydroxyfunctional crystalline materials in detail. Preferred is hydrogenated castor oil. Non-limiting examples of useful structurants include.. Such structurants have a thread-like structuring system having a range of aspect ratios. Other suitable structurants and the processes for making them are described in WO2010/034736.

The composition of the present invention may comprise a high melting point fatty compound. The high melting point fatty compound useful herein has a melting point of 25°C or higher, and is selected from the group consisting of fatty alcohols, fatty acids, fatty alcohol derivatives, fatty acid derivatives, and mixtures thereof. Such compounds of low melting point are not intended to be included in this section. Non-limiting examples of the high melting point compounds are found in International Cosmetic Ingredient Dictionary, Fifth Edition, 1993, and CTFA Cosmetic Ingredient Handbook, Second Edition, 1992. When present, the high melting point fatty compound is preferably included in the composition at a level of from 0.1% to 40%, preferably from 1% to 30%, more preferably from 1.5% to 16% by weight of the composition, from 1.5% to 8% in view of providing improved conditioning benefits such as slippery feel during the application to wet hair, softness and moisturized feel on dry hair.

**Cationic Polymer.** The compositions of the present invention may contain a cationic polymer. Concentrations of the cationic polymer in the composition typically range from 0.05% to 3%, in another embodiment from 0.075% to 2.0%, and in yet another embodiment from 0.1% to 1.0%. Suitable cationic polymers will have cationic charge densities of at least 0.5 meq/gm, in another embodiment at least 0.9 meq/gm, in another embodiment at least 1.2 meq/gm, in yet another embodiment at least 1.5 meq/gm, but in one embodiment also less than 7 meq/gm, and in another embodiment less than 5 meq/gm, at the pH of intended use of the composition, which pH will generally range from pH 3 to pH 9, in one embodiment between pH 4 and pH 8. Herein, "cationic charge density" of a polymer refers to the ratio of the number of positive charges on the polymer to the molecular weight of the polymer. The average molecular weight of such suitable cationic polymers will generally be between 10,000 and 10 million, in one embodiment between 50,000 and 5 million, and in another embodiment between 100,000 and 3 million.

Suitable cationic polymers for use in the compositions of the present invention contain cationic nitrogen-containing moieties such as quaternary ammonium or cationic protonated

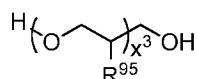
amino moieties. Any anionic counterions can be used in association with the cationic polymers so long as the polymers remain soluble in water, in the composition, or in a coacervate phase of the composition, and so long as the counterions are physically and chemically compatible with the essential components of the composition or do not otherwise unduly impair product performance, stability or aesthetics. Nonlimiting examples of such counterions include halides (e.g., chloride, fluoride, bromide, iodide), sulfate and methylsulfate.

Nonlimiting examples of such polymers are described in the CTFA Cosmetic Ingredient Dictionary, 3rd edition, edited by Estrin, Crosley, and Haynes, (The Cosmetic, Toiletry, and Fragrance Association, Inc., Washington, D.C. (1982)).

Other suitable cationic polymers for use in the composition include polysaccharide polymers, cationic guar gum derivatives, quaternary nitrogen-containing cellulose ethers, synthetic polymers, copolymers of etherified cellulose, guar and starch. When used, the cationic polymers herein are either soluble in the composition or are soluble in a complex coacervate phase in the composition formed by the cationic polymer and the anionic, amphoteric and/or zwitterionic surfactant component described hereinbefore. Complex coacervates of the cationic polymer can also be formed with other charged materials in the composition.

Suitable cationic polymers are described in U.S. Pat. Nos. 3,962,418; 3,958,581; and U.S. Publication No. 2007/0207109A1.

**Nonionic Polymer.** The composition of the present invention may include a nonionic polymer as a conditioning agent. Polyalkylene glycols having a molecular weight of more than 1000 are useful herein. Useful are those having the following general formula:



wherein R<sup>95</sup> is selected from the group consisting of H, methyl, and mixtures thereof. Conditioning agents, and in particular silicones, may be included in the composition. The conditioning agents useful in the compositions of the present invention typically comprise a water insoluble, water dispersible, non-volatile, liquid that forms emulsified, liquid particles. Suitable conditioning agents for use in the composition are those conditioning agents characterized generally as silicones (e.g., silicone oils, cationic silicones, silicone gums, high refractive silicones, and silicone resins), organic conditioning oils (e.g., hydrocarbon oils, polyolefins, and fatty esters) or combinations thereof, or those conditioning agents which otherwise form liquid, dispersed particles in the aqueous surfactant matrix herein. Such conditioning agents should be physically and chemically compatible with the essential

components of the composition, and should not otherwise unduly impair product stability, aesthetics or performance.

The concentration of the conditioning agent in the composition should be sufficient to provide the desired conditioning benefits. Such concentration can vary with the conditioning agent, the conditioning performance desired, the average size of the conditioning agent particles, the type and concentration of other components, and other like factors.

The concentration of the silicone conditioning agent typically ranges from about 0.01% to about 10%. Non-limiting examples of suitable silicone conditioning agents, and optional suspending agents for the silicone, are described in U.S. Reissue Pat. No. 34,584, U.S. Pat. Nos. 5,104,646; 5,106,609; 4,152,416; 2,826,551; 3,964,500; 4,364,837; 6,607,717; 6,482,969; 5,807,956; 5,981,681; 6,207,782; 7,465,439; 7,041,767; 7,217,777; US Patent Application Nos. 2007/0286837A1; 2005/0048549A1; 2007/0041929A1; British Pat. No. 849,433; German Patent No. DE 10036533, which are all incorporated herein by reference; Chemistry and Technology of Silicones, New York: Academic Press (1968); General Electric Silicone Rubber Product Data Sheets SE 30, SE 33, SE 54 and SE 76; Silicon Compounds, Petrarch Systems, Inc. (1984); and in Encyclopedia of Polymer Science and Engineering, vol. 15, 2d ed., pp 204-308, John Wiley & Sons, Inc. (1989).

**Organic Conditioning Oil.** The compositions of the present invention may also comprise from about 0.05% to about 3% of at least one organic conditioning oil as the conditioning agent, either alone or in combination with other conditioning agents, such as the silicones (described herein). Suitable conditioning oils include hydrocarbon oils, polyolefins, and fatty esters. Also suitable for use in the compositions herein are the conditioning agents described by the Procter & Gamble Company in U.S. Pat. Nos. 5,674,478, and 5,750,122. Also suitable for use herein are those conditioning agents described in U.S. Pat. Nos. 4,529,586, 4,507,280, 4,663,158, 4,197,865, 4,217, 914, 4,381,919, and 4,422, 853.

**Hygiene Agent.** The compositions of the present invention may also comprise components to deliver hygiene and/or malodour benefits such as one or more of zinc ricinoleate, thymol, quaternary ammonium salts such as Bardac®, polyethylenimines (such as Lupasol® from BASF) and zinc complexes thereof, silver and silver compounds, especially those designed to slowly release Ag<sup>+</sup> or nano-silver dispersions.

**Probiotics.** The composition may comprise probiotics, such as those described in WO2009/043709.

**Suds Boosters.** The composition may preferably comprise suds boosters if high sudsing is desired. Suitable examples are the C10-C16 alkanolamides or C10-C14 alkyl sulphates, which

are preferably incorporated at 1%-10% levels. The C10-C14 monoethanol and diethanol amides illustrate a typical class of such suds boosters. Use of such suds boosters with high sudsing adjunct surfactants such as the amine oxides, betaines and sultaines noted above is also advantageous. If desired, water-soluble magnesium and/or calcium salts such as MgCl<sub>2</sub>,  
5 MgSO<sub>4</sub>, CaCl<sub>2</sub>, CaSO<sub>4</sub> and the like, can be added at levels of, typically, 0.1%-2%, to provide additional suds and to enhance grease removal performance.

**Suds Suppressor.** Compounds for reducing or suppressing the formation of suds may be incorporated into the compositions of the present invention. Suds suppression can be of particular importance in the so-called "high concentration cleaning process" as described in U.S.  
10 Pat. No. 4,489,455 and 4,489,574, and in front-loading -style washing machines. A wide variety of materials may be used as suds suppressors, and suds suppressors are well known to those skilled in the art. See, for example, Kirk Othmer Encyclopedia of Chemical Technology, Third Edition, Volume 7, pages 430-447 (John Wiley & Sons, Inc., 1979). Examples of suds suppressors include monocarboxylic fatty acid and soluble salts therein, high molecular weight  
15 hydrocarbons such as paraffin, fatty acid esters (e.g., fatty acid triglycerides), fatty acid esters of monovalent alcohols, aliphatic C18-C40 ketones (e.g., stearone), N-alkylated amino triazines, waxy hydrocarbons preferably having a melting point below about 100 °C, silicone suds suppressors, and secondary alcohols. Suds suppressors are described in U.S. Pat. No. 2,954,347; 4,265,779; 4,265,779; 3,455,839; 3,933,672; 4,652,392; 4,978,471; 4,983,316; 5,288,431;  
20 4,639,489; 4,749,740; and 4,798,679; 4,075,118; European Patent Application No. 89307851.9; EP 150,872; and DOS 2,124,526.

For any detergent compositions to be used in automatic laundry washing machines, suds should not form to the extent that they overflow the washing machine. Suds suppressors, when utilized, are preferably present in a "suds suppressing amount. By "suds suppressing amount" is  
25 meant that the formulator of the composition can select an amount of this suds controlling agent that will sufficiently control the suds to result in a low-sudsing laundry detergent for use in automatic laundry washing machines. The compositions herein will generally comprise from 0% to 10% of suds suppressor. When utilized as suds suppressors, monocarboxylic fatty acids, and salts therein, will be present typically in amounts up to 5%, by weight, of the detergent  
30 composition. Preferably, from 0.5% to 3% of fatty monocarboxylate suds suppressor is utilized. Silicone suds suppressors are typically utilized in amounts up to 2.0%, by weight, of the detergent composition, although higher amounts may be used. Monostearyl phosphate suds suppressors are generally utilized in amounts ranging from 0.1% to 2%, by weight, of the composition. Hydrocarbon suds suppressors are typically utilized in amounts ranging from

0.01% to 5.0%, although higher levels can be used. The alcohol suds suppressors are typically used at 0.2%-3% by weight of the finished compositions.

**Pearlescent Agents.** Pearlescent agents as described in WO2011/163457 may be incorporated into the compositions of the invention.

5       **Perfume.** Preferably the composition comprises a perfume, preferably in the range from 0.001 to 3wt%, most preferably from 0.1 to 1 wt%. Many suitable examples of perfumes are provided in the CFTA (Cosmetic, Toiletry and Fragrance Association) 1992 International Buyers Guide, published by CFTA Publications and OPD 1993 Chemicals Buyers Directory 80<sup>th</sup> Annual Edition, published by Schnell Publishing Co. It is usual for a plurality of perfume  
10 components to be present in the compositions of the invention, for example four, five, six, seven or more. 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 [1995]). Preferred top notes include rose oxide, citrus oils, linalyl acetate, lavender, linalool, dihydromyrcenol and cis-3-hexanol.

15       **Packaging.** Any conventional packaging may be used and the packaging may be fully or partially transparent so that the consumer can see the colour of the product which may be provided or contributed to by the colour of the dyes essential to the invention. UV absorbing compounds may be included in some or all of the packaging.

#### **Process of Making Compositions**

20       The compositions of the invention may be in any useful form, as described above. They may be made by any process chosen by the formulator, non-limiting examples of which are described in the examples and in U.S. 4,990,280; U.S. 20030087791A1; U.S. 20030087790A1; U.S. 20050003983A1; U.S. 20040048764A1; U.S. 4,762,636; U.S. 6,291,412; U.S. 20050227891A1; EP 1070115A2; U.S. 5,879,584; U.S. 5,691,297; U.S. 5,574,005; U.S.  
25 5,569,645; U.S. 5,565,422; U.S. 5,516,448; U.S. 5,489,392; U.S. 5,486.

When in the form of a liquid, the laundry care compositions of the invention may be aqueous (typically above 2 wt% or even above 5 or 10 wt% total water, up to 90 or up to 80wt% or 70 wt% total water) or non-aqueous (typically below 2 wt% total water content). Typically the compositions of the invention will be in the form of an aqueous solution or uniform  
30 dispersion or suspension of surfactant, shading dye, and certain optional other ingredients, some of which may normally be in solid form, that have been combined with the normally liquid components of the composition, such as the liquid alcohol ethoxylate nonionic, the aqueous liquid carrier, and any other normally liquid optional ingredients. Such a solution, dispersion or suspension will be acceptably phase stable. When in the form of a liquid, the laundry care

compositions of the invention preferably have viscosity from 1 to 1500 centipoises (1-1500 mPa\*s), more preferably from 100 to 1000 centipoises (100-1000 mPa\*s), and most preferably from 200 to 500 centipoises (200-500 mPa\*s) at 20s-1 and 21°C. Viscosity can be determined by conventional methods. Viscosity may be measured using an AR 550 rheometer from TA  
5 instruments using a plate steel spindle at 40 mm diameter and a gap size of 500 µm. The high shear viscosity at 20s-1 and low shear viscosity at 0.05-1 can be obtained from a logarithmic shear rate sweep from 0.1-1 to 25-1 in 3 minutes time at 21°C. The preferred rheology described therein may be achieved using internal existing structuring with detergent ingredients or by employing an external rheology modifier. More preferably the laundry care compositions, such  
10 as detergent liquid compositions have a high shear rate viscosity of from about 100 centipoise to 1500 centipoise, more preferably from 100 to 1000 cps. Unit Dose laundry care compositions, such as detergent liquid compositions have high shear rate viscosity of from 400 to 1000cps. Laundry care compositions such as laundry softening compositions typically have high shear rate viscosity of from 10 to 1000, more preferably from 10 to 800 cps, most preferably from 10 to 500  
15 cps. Hand dishwashing compositions have high shear rate viscosity of from 300 to 4000 cps, more preferably 300 to 1000 cps.

The liquid compositions, preferably liquid detergent compositions herein can be prepared by combining the components thereof in any convenient order and by mixing, e.g., agitating, the resulting component combination to form a phase stable liquid detergent composition. In a  
20 process for preparing such compositions, a liquid matrix is formed containing at least a major proportion, or even substantially all, of the liquid components, e.g., nonionic surfactant, the non-surface active liquid carriers and other optional liquid components, with the liquid components being thoroughly admixed by imparting shear agitation to this liquid combination. For example, rapid stirring with a mechanical stirrer may usefully be employed. While shear agitation is  
25 maintained, substantially all of any anionic surfactants and the solid form ingredients can be added. Agitation of the mixture is continued, and if necessary, can be increased at this point to form a solution or a uniform dispersion of insoluble solid phase particulates within the liquid phase. After some or all of the solid-form materials have been added to this agitated mixture, particles of any enzyme material to be included, e.g., enzyme prills, are incorporated. As a  
30 variation of the composition preparation procedure hereinbefore described, one or more of the solid components may be added to the agitated mixture as a solution or slurry of particles premixed with a minor portion of one or more of the liquid components. After addition of all of the composition components, agitation of the mixture is continued for a period of time sufficient

to form compositions having the requisite viscosity and phase stability characteristics. Frequently this will involve agitation for a period of from about 30 to 60 minutes.

In one aspect of forming the liquid compositions, the dye is first combined with one or more liquid components to form a dye premix, and this dye premix is added to a composition  
5 formulation containing a substantial portion, for example more than 50% by weight, more specifically, more than 70% by weight, and yet more specifically, more than 90% by weight, of the balance of components of the laundry detergent composition. For example, in the methodology described above, both the dye premix and the enzyme component are added at a final stage of component additions. In another aspect, the dye is encapsulated prior to addition to  
10 the detergent composition, the encapsulated dye is suspended in a structured liquid, and the suspension is added to a composition formulation containing a substantial portion of the balance of components of the laundry detergent composition.

**Pouches.** In a preferred embodiment of the invention, the composition is provided in the form of a unitized dose, either tablet form or preferably in the form of a liquid/solid (optionally  
15 granules)/gel/paste held within a water-soluble film in what is known as a pouch or pod. The composition can be encapsulated in a single or multi-compartment pouch. Multi-compartment pouches are described in more detail in EP-A-2133410. When the composition is present in a multi-compartment pouch, the composition of the invention may be in one or two or more compartments, thus the dye may be present in one or more compartments, optionally all  
20 compartments. Non-shading dyes or pigments or other aesthetics may also be used in one or more compartments. In one embodiment the composition is present in a single compartment of a multi-compartment pouch.

Suitable film for forming the pouches is soluble or dispersible in water, and preferably has a water-solubility/dispersibility of at least 50%, preferably at least 75% or even at least 95%,  
25 as measured by the method set out here after using a glass-filter with a maximum pore size of 20 microns:

50 grams  $\pm$  0.1 gram of pouch material is added in a pre-weighed 400 ml beaker and 245ml  $\pm$  1ml of distilled water is added. This is stirred vigorously on a magnetic stirrer set at 600 rpm, for 30 minutes. Then, the mixture is filtered through a folded qualitative sintered-glass  
30 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. Preferred film materials are polymeric materials. The film material can be obtained, for example, by casting, blow-moulding, extrusion or blown extrusion

of the polymeric material, as known in the art. 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. Mixtures of polymers can also be used as the pouch material. This can be beneficial to control the mechanical and/or dissolution properties of the compartments or pouch, depending on the application thereof and the required needs. Suitable mixtures include for example mixtures wherein one polymer has a higher water-solubility than another polymer, and/or one polymer has a higher mechanical strength than another polymer. Also suitable are mixtures of polymers having different weight average molecular weights, for example a mixture of PVA or a copolymer thereof of a weight average molecular weight of about 10,000- 40,000, preferably around 20,000, and of PVA or copolymer thereof, with a weight average molecular weight of about 100,000 to 300,000, preferably around 150,000. Also suitable herein are polymer blend compositions, for example comprising hydrolytically degradable and water-soluble polymer blends such as polylactide and polyvinyl alcohol, obtained by mixing polylactide and polyvinyl alcohol, typically comprising about 1-35% by weight polylactide and about 65% to 99% by weight polyvinyl alcohol. Preferred for use herein are polymers which are from about 60% to about 98% hydrolysed, preferably about 80% to about 90% hydrolysed, to improve the dissolution characteristics of the material.

Naturally, different film material and/or films of different thickness may be employed in making the compartments of the present invention. A benefit in selecting different films is that the resulting compartments may exhibit different solubility or release characteristics.

Most preferred film materials are PVA films known under the MonoSol trade reference M8630, M8900, H8779 (as described in the Applicants co-pending applications ref 44528 and



11599) and those described in US 6 166 117 and US 6 787 512 and PVA films of corresponding solubility and deformability characteristics.

The film material herein can also comprise one or more additive ingredients. For example, it can be beneficial to add plasticisers, for example glycerol, ethylene glycol, diethyleneglycol, propylene glycol, sorbitol and mixtures thereof. Other additives include functional detergent additives to be delivered to the wash water, for example organic polymeric dispersants, etc.

### **Process for Making the Water-Soluble Pouch**

The compositions of the invention in pouch form may be made using any suitable equipment and method. However the multi-compartment pouches are preferably made using the horizontal form filling process. The film is preferably wetting, more preferably heated to increase the malleability thereof. Even more preferably, the method also involves the use of a vacuum to draw the film into a suitable mould. The vacuum drawing the film into the mould can be applied for 0.2 to 5 seconds, preferably 0.3 to 3 or even more preferably 0.5 to 1.5 seconds, once the film is on the horizontal portion of the surface. This vacuum may preferably be such that it provides an under-pressure of between -100mbar to -1000mbar, or even from -200mbar to -600mbar.

The moulds, in which the pouches are made, can have any shape, length, width and depth, depending on the required dimensions of the pouches. The moulds can also vary in size and shape from one to another, if desirable. For example, it may be preferred that the volume of the final pouches is between 5 and 300ml, or even 10 and 150ml or even 20 and 100ml and that the mould sizes are adjusted accordingly.

Heat can be applied to the film, in the process commonly known as thermoforming, by any means. For example the film may be heated directly by passing it under a heating element or through hot air, prior to feeding it onto the surface or once on the surface. Alternatively it may be heated indirectly, for example by heating the surface or applying a hot item onto the film. Most preferably the film is heated using an infra red light. The film is preferably heated to a temperature of 50 to 120°C, or even 60 to 90°C. Alternatively, the film can be wetted by any mean, for example directly by spraying a wetting agent (including water, solutions of the film material or plasticizers for the film material) onto the film, prior to feeding it onto the surface or once on the surface, or indirectly by wetting the surface or by applying a wet item onto the film.

In the case of pouches comprising powders it is advantageous to pin prick the film for a number of reasons: (a) to reduce the possibility of film defects during the pouch formation, for example film defects giving rise to rupture of the film can be generated if the stretching of the film is too fast; (b) to permit the release of any gases derived from the product enclosed in the

pouch, as for example oxygen formation in the case of powders containing bleach; and/or (c) to allow the continuous release of perfume. Moreover, when heat and/or wetting is used, pin pricking can be used before, during or after the use of the vacuum, preferably during or before application of the vacuum. Preferred is thus that each mould comprises one or more holes which are connected to a system which can provide a vacuum through these holes, onto the film above the holes, as described herein in more detail.

Once a film has been heated/wetted, it is drawn into an appropriate mould, preferably using a vacuum. The filling of the moulded film can be done by any known method for filling (moving) items. The most preferred method will depend on the product form and speed of filling required. Preferably the moulded film is filled by in-line filling techniques. The filled, open pouches are then closed, using a second film, by any suitable method. Preferably, this is also done while in horizontal position and in continuous, constant motion. Preferably the closing is done by continuously feeding a second material or film, preferably water-soluble film, over and onto the web of open pouches and then preferably sealing the first film and second film together, typically in the area between the moulds and thus between the pouches.

Preferred methods of sealing include heat sealing, solvent welding, and solvent or wet sealing. It is preferred that only the area which is to form the seal, is treated with heat or solvent. The heat or solvent can be applied by any method, preferably on the closing material, preferably only on the areas which are to form the seal. If solvent or wet sealing or welding is used, it may be preferred that heat is also applied. Preferred wet or solvent sealing/ welding methods include applying selectively solvent onto the area between the moulds, or on the closing material, by for example, spraying or printing this onto these areas, and then applying pressure onto these areas, to form the seal. Sealing rolls and belts as described above (optionally also providing heat) can be used, for example.

The formed pouches can then be cut by a cutting device. Cutting can be done using any known method. It may be preferred that the cutting is also done in continuous manner, and preferably with constant speed and preferably while in horizontal position. The cutting device can, for example, be a sharp item or a hot item, whereby in the latter case, the hot item 'burns' through the film/ sealing area.

The different compartments of a multi-compartment pouch may be made together in a side-by-side style and consecutive pouches are not cut. Alternatively, the compartments can be made separately. According to this process and preferred arrangement, the pouches are made according to the process comprising the steps of:

- a) forming an first compartment (as described above);

- b) forming a recess within some or all of the closed compartment formed in step (a), to generate a second moulded compartment superposed above the first compartment;
- c) filling and closing the second compartments by means of a third film;
- d) sealing said first, second and third films; and
- 5 e) cutting the films to produce a multi-compartment pouch.

Said recess formed in step b is preferably achieved by applying a vacuum to the compartment prepared in step a).

Alternatively the second, and optionally third, compartment(s) can be made in a separate step and then combined with the first compartment as described in our co-pending application EP  
10 08101442.5 which is incorporated herein by reference. A particularly preferred process comprises the steps of:

- a) forming a first compartment, optionally using heat and/or vacuum, using a first film on a first forming machine;
- b) filling said first compartment with a first composition;
- 15 c) on a second forming machine, deforming a second film, optionally using heat and vacuum, to make a second and optionally third moulded compartment;
- d) filling the second and optionally third compartments;
- e) sealing the second and optionally third compartment using a third film;
- f) placing the sealed second and optionally third compartments onto the first compartment;
- 20 g) sealing the first, second and optionally third compartments; and
- h) cutting the films to produce a multi-compartment pouch

The first and second forming machines are selected based on their suitability to perform the above process. The first forming machine is preferably a horizontal forming machine. The second forming machine is preferably a rotary drum forming machine, preferably located above  
25 the first forming machine.

It will be understood moreover that by the use of appropriate feed stations, it is possible to manufacture multi-compartment pouches incorporating a number of different or distinctive compositions and/or different or distinctive liquid, gel or paste compositions.

**Solid Form.** As noted previously, the laundry care compositions may be in a solid form.  
30 Suitable solid forms include tablets and particulate forms, for example, granular particles, flakes or sheets. Various techniques for forming detergent compositions in such solid forms are well known in the art and may be used herein. In one aspect, for example when the composition is in the form of a granular particle, the dye is provided in particulate form, optionally including additional but not all components of the laundry detergent composition. The dye particulate is

combined with one or more additional particulates containing a balance of components of the laundry detergent composition. Further, the dye, optionally including additional but not all components of the laundry detergent composition, may be provided in an encapsulated form, and the shading dye encapsulate is combined with particulates containing a substantial balance of components of the laundry detergent composition. Suitable pre-mix particles for incorporation of dyes/benefit agents into laundry care compositions of the invention are described for example in WO2010/084039, WO2007/039042, WO2010/022775, WO2009/132870, WO2009/087033, WO2007/006357, WO2007/039042, WO2007/096052, WO2011/020991, WO2006/053598, WO2003/018740 and WO2003/018738.

Method of Use. The compositions of this invention, prepared as hereinbefore described, can be used to form aqueous washing/treatment solutions for use in the laundering/treatment of fabrics. Generally, an effective amount of such compositions is added to water, for example in a conventional fabric automatic washing machine, to form such aqueous laundering solutions. The aqueous washing solution so formed is then contacted, typically under agitation, with the fabrics to be laundered/treated therewith. An effective amount of the liquid detergent compositions herein added to water to form aqueous laundering solutions can comprise amounts sufficient to form from about 500 to 7,000 ppm of composition in aqueous washing solution, or from about 1,000 to 3,000 ppm of the detergent compositions herein will be provided in aqueous washing solution.

Typically, the wash liquor is formed by contacting the laundry care composition with wash water in such an amount so that the concentration of the laundry care composition in the wash liquor is from above 0g/l to 5g/l, or from 1g/l, and to 4.5g/l, or to 4.0g/l, or to 3.5g/l, or to 3.0g/l, or to 2.5g/l, or even to 2.0g/l, or even to 1.5g/l. The method of laundering fabric or textile may be carried out in a top-loading or front-loading automatic washing machine, or can be used in a hand-wash laundry application. In these applications, the wash liquor formed and concentration of laundry detergent composition in the wash liquor is that of the main wash cycle. Any input of water during any optional rinsing step(s) is not included when determining the volume of the wash liquor.

The wash liquor may comprise 40 litres or less of water, or 30 litres or less, or 20 litres or less, or 10 litres or less, or 8 litres or less, or even 6 litres or less of water. The wash liquor may comprise from above 0 to 15 litres, or from 2 litres, and to 12 litres, or even to 8 litres of water. Typically from 0.01kg to 2kg of fabric per litre of wash liquor is dosed into said wash liquor. Typically from 0.01kg, or from 0.05kg, or from 0.07kg, or from 0.10kg, or from 0.15kg, or from 0.20kg, or from 0.25kg fabric per litre of wash liquor is dosed into said wash liquor. Optionally,

50g or less, or 45g or less, or 40g or less, or 35g or less, or 30g or less, or 25g or less, or 20g or less, or even 15g or less, or even 10g or less of the composition is contacted to water to form the wash liquor. Such compositions are typically employed at concentrations of from about 500 ppm to about 15,000 ppm in solution. When the wash solvent is water, the water temperature typically ranges from about 5 °C to about 90 °C and, when the situs comprises a fabric, the water to fabric ratio is typically from about 1:1 to about 30:1. Typically the wash liquor comprising the laundry care composition of the invention has a pH of from 3 to 11.5.

In one aspect, such method comprises the steps of optionally washing and/or rinsing said surface or fabric, contacting said surface or fabric with any composition disclosed in this specification then optionally washing and/or rinsing said surface or fabric is disclosed, with an optional drying step.

Drying of such surfaces or fabrics may be accomplished by any one of the common means employed either in domestic or industrial settings. The fabric may comprise any fabric capable of being laundered in normal consumer or institutional use conditions, and the invention is particularly suitable for synthetic textiles such as polyester and nylon and especially for treatment of mixed fabrics and/or fibres comprising synthetic and cellulosic fabrics and/or fibres. As examples of synthetic fabrics are polyester, nylon, these may be present in mixtures with cellulosic fibres, for example, polycotton fabrics. The solution typically has a pH of from 7 to 11, more usually 8 to 10.5. The compositions are typically employed at concentrations from 500 ppm to 5,000 ppm in solution. The water temperatures typically range from about 5 °C to about 90 °C. The water to fabric ratio is typically from about 1:1 to about 30:1.

One further problem which is alleviated by the compositions and methods of the present invention is that typically although the hue provided by a fabric shading dye would be identical independent of the fabric type, in practice this is not normally the case, and the hue typically shifts considerably depending on the fabric on which it resides. The compositions and methods of the present invention alleviate this problem: the hue shift provided is lower than that produced with prior art dyes between cellulosic and synthetic fabrics and/or fibres and between different synthetic fabrics and/or fibres.

Thus the compositions and methods of the invention provide good deposition across a range of fabrics, both extent and evenness, the consistency of the hue it imparts to those fabrics, and its ability to be removed in subsequent washes is also good, avoiding overhueing even on synthetic fabrics such as nylon.

Examples 2-7

Granular laundry detergent compositions for hand washing or washing machines, typically top-loading washing machines.

	2 (wt %)	3 (wt %)	4 (wt %)	5 (wt %)	6 (wt %)	7 (wt %)
Linear alkylbenzenesulfonate	20	22	20	15	19.5	20
C <sub>12-14</sub> Dimethylhydroxyethyl ammonium chloride	0.7	0.2	1	0.6	0.0	0
AE3S	0.9	1	0.9	0.0	0.4	0.9
AE7	0.0	0.0	0.0	1	0.1	3
Sodium tripolyphosphate	5	0.0	4	9	2	0.0
Zeolite A	0.0	1	0.0	1	4	1
1.6R Silicate (SiO <sub>2</sub> :Na <sub>2</sub> O ratio 1.6:1)	7	5	2	3	3	5
Sodium carbonate	25	20	25	17	18	19
Polyacrylate MW 4500	1	0.6	1	1	1.5	1
Random graft copolymer <sup>1</sup>	0.1	0.2	0.0	0.0	0.05	0.0
Carboxymethyl cellulose	1	0.3	1	1	1	1
Stainzyme® (20 mg active/g)	0.1	0.2	0.1	0.2	0.1	0.1
Protease (Savinase®, 32.89 mg active/g)	0.1	0.1	0.1	0.1		0.1
Amylase - Natalase® (8.65 mg active /g)	0.1	0.0	0.1	0.0	0.1	0.1
Lipase - Lipex® (18 mg active /g)	0.03	0.07	0.3	0.1	0.07	0.4
Any dye or mixture of dyes from Table 1	0.01	0.001	0.003	0.0005	0.002	0.0009
Fluorescent Brightener 1	0.06	0.0	0.06	0.18	0.06	0.06
Fluorescent Brightener 2	0.1	0.06	0.1	0.0	0.1	0.1
DTPA	0.6	0.8	0.6	0.25	0.6	0.6
MgSO <sub>4</sub>	1	1	1	0.5	1	1
Sodium Percarbonate	0.0	5.2	0.1	0.0	0.0	0.0
Sodium Perborate Monohydrate	4.4	0.0	3.85	2.09	0.78	3.63
NOBS	1.9	0.0	1.66	0.0	0.33	0.75
TAED	0.58	1.2	0.51	0.0	0.015	0.28
Sulphonated zinc phthalocyanine	0.0030	0.0	0.0012	0.0030	0.0021	0.0
S-ACMC	0.1	0.0	0.0	0.0	0.06	0.0
Direct Violet Dye (DV9 or DV99 or DV66)	0.0	0.0	0.0003	0.0001	0.0001	0.0
Sulfate/Moisture	Balance					

Examples 8-13

Granular laundry detergent compositions typically for front-loading automatic washing

machines.

	8 (wt%)	9 (wt%)	10 (wt%)	11 (wt%)	12 (wt%)	13 (wt%)
Linear alkylbenzenesulfonate	8	7.1	7	6.5	7.5	7.5
AE3S	0	4.8	1.0	5.2	4	4
C12-14 Alkylsulfate	1	0	1	0	0	0
AE7	2.2	0	2.2	0	0	0
C <sub>10-12</sub> Dimethyl hydroxyethylammonium chloride	0.75	0.94	0.98	0.98	0	0
Crystalline layered silicate ( $\delta$ -Na <sub>2</sub> Si <sub>2</sub> O <sub>5</sub> )	4.1	0	4.8	0	0	0
Zeolite A	5	0	5	0	2	2
Citric Acid	3	5	3	4	2.5	3
Sodium Carbonate	15	20	14	20	23	23
Silicate 2R (SiO <sub>2</sub> :Na <sub>2</sub> O at ratio 2:1)	0.08	0	0.11	0	0	0
Soil release agent	0.75	0.72	0.71	0.72	0	0
Acrylic Acid/Maleic Acid Copolymer	1.1	3.7	1.0	3.7	2.6	3.8
Carboxymethylcellulose	0.15	1.4	0.2	1.4	1	0.5
Protease - Purafect® (84 mg active/g)	0.2	0.2	0.3	0.15	0.12	0.13
Amylase - Stainzyme Plus® (20 mg active/g)	0.2	0.15	0.2	0.3	0.15	0.15
Lipase - Lipex® (18.00 mg active/g)	0.05	0.15	0.1	0	0	0
Amylase - Natalase® (8.65 mg active/g)	0.1	0.2	0	0	0.15	0.15
Cellulase - Celluclean™ (15.6 mg active/g)	0	0	0	0	0.1	0.1
Any dye or mixture of dyes from Table 1	0.01	0.006	0.008	0.007	0.02	0.005
TAED	3.6	4.0	3.6	4.0	2.2	1.4
Percarbonate	13	13.2	13	13.2	16	14
Na salt of Ethylenediamine-N,N'- disuccinic acid, (S,S) isomer (EDDS)	0.2	0.2	0.2	0.2	0.2	0.2
Hydroxyethane di phosphonate (HEDP)	0.2	0.2	0.2	0.2	0.2	0.2
MgSO <sub>4</sub>	0.42	0.42	0.42	0.42	0.4	0.4
Perfume	0.5	0.6	0.5	0.6	0.6	0.6
Suds suppressor agglomerate	0.05	0.1	0.05	0.1	0.06	0.05
Soap	0.45	0.45	0.45	0.45	0	0
Sulphonated zinc phthalocyanine (active)	0.0007	0.0012	0.0007	0	0	0
S-ACMC	0.01	0.01	0	0.01	0	0
Direct Violet 9 (active)	0	0	0.0001	0.0001	0	0
Sulfate/ Water & Miscellaneous	Balance					

- Any of the above compositions is used to launder fabrics at a concentration of 7000 to 10000 ppm in water, 20-90 °C, and a 5:1 water:cloth ratio. The typical pH is about 10. The fabrics are then dried. In one aspect, the fabrics are actively dried using a dryer. In one aspect, the fabrics are actively dried using an iron. In another aspect, the fabrics are merely allowed to dry on a line wherein they are exposed to air and optionally sunlight.

Examples 14-20 Heavy Duty Liquid laundry detergent compositions

	14 (wt%)	15 (wt%)	16 (wt%)	17 (wt%)	18 (wt%)	19 (wt%)	20 (wt%)
AES C <sub>12-15</sub> alkyl ethoxy (1.8) sulfate	11	10	4	6.32	0	0	0
AE3S	0	0	0	0	2.4	0	0
Linear alkyl benzene sulfonate/sulfonic acid	1.4	4	8	3.3	5	8	19
HSAS	3	5.1	3	0	0	0	0
Sodium formate	1.6	0.09	1.2	0.04	1.6	1.2	0.2
Sodium hydroxide	2.3	3.8	1.7	1.9	1.7	2.5	2.3
Monoethanolamine	1.4	1.49	1.0	0.7	0	0	To pH 8.2
Diethylene glycol	5.5	0.0	4.1	0.0	0	0	0
AE9	0.4	0.6	0.3	0.3	0	0	0
AE8	0	0	0	0	0	0	20.0
AE7	0	0	0	0	2.4	6	0
Chelant (HEDP)	0.15	0.15	0.11	0.07	0.5	0.11	0.8
Citric Acid	2.5	3.96	1.88	1.98	0.9	2.5	0.6
C <sub>12-14</sub> dimethyl Amine Oxide	0.3	0.73	0.23	0.37	0	0	0
C <sub>12-18</sub> Fatty Acid	0.8	1.9	0.6	0.99	1.2	0	15.0
4-formyl-phenylboronic acid	0	0	0	0	0.05	0.02	0.01
Borax	1.43	1.5	1.1	0.75	0	1.07	0
Ethanol	1.54	1.77	1.15	0.89	0	3	7
A compound having the following general structure: bis((C <sub>2</sub> H <sub>5</sub> O)(C <sub>2</sub> H <sub>4</sub> O) <sub>n</sub> )(CH <sub>3</sub> )-N <sup>+</sup> -C <sub>x</sub> H <sub>2x</sub> -N <sup>+</sup> -(CH <sub>3</sub> )-bis((C <sub>2</sub> H <sub>5</sub> O)(C <sub>2</sub> H <sub>4</sub> O) <sub>n</sub> ), wherein n = from 20 to 30, and x = from 3 to 8, or sulphated or sulphonated variants thereof	0.1	0	0	0	0	0	2.0
Ethoxylated (EO <sub>15</sub> ) tetraethylene	0.3	0.33	0.23	0.17	0.0	0.0	



pentamine							0
Ethoxylated Polyethylenimine <sup>2</sup>	0	0	0	0	0	0	0.8
Ethoxylated hexamethylene diamine	0.8	0.81	0.6	0.4	1	1	
1,2-Propanediol	0.0	6.6	0.0	3.3	0.5	2	8.0
Fluorescent Brightener	0.2	0.1	0.05	0.3	0.15	0.3	0.2
Hydrogenated castor oil derivative structurant	0.1	0	0	0	0	0	0.1
Perfume	1.6	1.1	1.0	0.8	0.9	1.5	1.6
Core Shell Melamine-formaldehyde encapsulate of perfume	0.10	0.05	0.01	0.02	0.1	0.05	0.1
Protease (40.6 mg active/g)	0.8	0.6	0.7	0.9	0.7	0.6	1.5
Mannanase: Mannaway® (25 mg active/g)	0.07	0.05	0.045	0.06	0.04	0.045	0.1
Amylase: Stainzyme® (15 mg active/g)	0.3	0	0.3	0.1	0	0.4	0.1
Amylase: Natalase® (29 mg active/g)	0	0.2	0.1	0.15	0.07	0	0.1
Xyloglucanase (Whitezyme®, 20mg active/g)	0.2	0.1	0	0	0.05	0.05	0.2
Lipex® (18 mg active/g)	0.4	0.2	0.3	0.1	0.2	0	0
Any dye or mixture of dyes from Table 1	0.006	0.002	0.001	0.01	0.005	0.003	0.004
*Water, dyes & minors	Balance						

\* Based on total cleaning and/or treatment composition weight, a total of no more than 12% water

#### Examples 21 to 25 Unit Dose Compositions

- 5 This Example provides various formulations for unit dose laundry detergents. Such unit dose formulations can comprise one or multiple compartments.

The following unit dose laundry detergent formulations of the present invention are provided below.

<b><u>Ingredients</u></b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>
Alkylbenzene sulfonic acid C 11-13, 23.5% 2-phenyl isomer	14.5	14.5	14.5	14.5	14.5
C <sub>12-14</sub> alkyl ethoxy 3 sulfate	7.5	7.5	7.5	7.5	7.5
C <sub>12-14</sub> alkyl 7-ethoxylate	13.0	13.0	13.0	13.0	13.0

Citric Acid	0.6	0.6	0.6	0.6	0.6
Fatty Acid	14.8	14.8	14.8	14.8	14.8
Enzymes (as % raw material not active)	1.7	1.7	1.7	1.7	1.7
Ethoxylated Polyethylenimine <sup>1</sup>	4.0	4.0	4.0	4.0	4.0
Any dye or mixture of dyes from Table 1	0.005	0.006	0.003	0.001	0.1
Hydroxyethane diphosphonic acid	1.2	1.2	1.2	1.2	1.2
Brightener	0.3	0.3	0.3	0.3	0.3
P-diol	15.8	13.8	13.8	13.8	13.8
Glycerol	6.1	6.1	6.1	6.1	6.1
MEA	8.0	8.0	8.0	8.0	8.0
TIPA	-	-	2.0	-	-
TEA	-	2.0	-	-	-
Cumene sulphonate	-	-	-	-	2.0
cyclohexyl dimethanol	-	-	-	2.0	-
Water	10	10	10	10	10
Structurant	0.14	0.14	0.14	0.14	0.14
Perfume	1.9	1.9	1.9	1.9	1.9
Buffers (monoethanolamine)	To pH 8.0				
Solvents (1,2 propanediol, ethanol)	To 100%				

#### Example 26 Multiple Compartment Unit Dose Compositions

Multiple compartment unit dose laundry detergent formulations of the present invention are provided below. In these examples the unit dose has three compartments, but similar compositions can be made with two, four or five compartments. The film used to encapsulate the

5 compartments is polyvinyl alcohol.

Base Composition	26	27	28	29
<b>Ingredients %</b>				
Glycerol	5.3	5.0	5.0	4.2
1,2-propanediol	10.0	15.3	17.5	16.4
Citric Acid	0.5	0.7	0.6	0.5
Monoethanolamine	10.0	8.1	8.4	7.6
Caustic soda	-	-	-	-

Hydroxyethane diphosphonic acid	1.1	2.0	0.6	1.5
Polyethylene glycol	0	0	2.5	3.0
Potassium sulfite	0.2	0.3	0.5	0.7
Nonionic Marlipal C24EO <sub>7</sub>	20.1	14.3	13.0	18.6
HLAS	24.6	18.4	17.0	14.8
Fluorescent Brightener 1 +/- or 2	0.2	0.2	0.02	0.3
Enzymes: protease, amylase, mannanase, lipase, cellulose and/or pectate lyase	1.5	1.5	1.0	0.4
C12-15 Fatty acid	16.4	6.0	11.0	13.0
bis((C <sub>2</sub> H <sub>5</sub> O)(C <sub>2</sub> H <sub>4</sub> O) <sub>n</sub> )(CH <sub>3</sub> )-N <sup>+</sup> -C <sub>x</sub> H <sub>2x</sub> -N <sup>+</sup> -(CH <sub>3</sub> )-bis((C <sub>2</sub> H <sub>5</sub> O)(C <sub>2</sub> H <sub>4</sub> O) <sub>n</sub> ), wherein n = from 20 to 30, and x = from 3 to 8, or sulphated or sulphonated variants thereof	2.9	0.1	0	0
Polyethyleneimine ethoxylate PEI600 E20	1.1	5.1	2.5	4.2
Cationic cellulose polymer	0	0	0.3	0.5
Random graft copolymer	0	1.5	0.3	0.2
MgCl <sub>2</sub>	0.2	0.2	0.1	0.3
Structurant	0.2	0.12	0.2	0.2
Perfume (may include perfume microcapsules)	0.1	0.3	0.01	0.05
Solvents (1,2 propanediol, ethanol) and optional aesthetics	To 100%	To 100%	To 100%	To 100%

Composition	30				31		
Compartment	A	B	C		A	B	C
Volume of each compartment	40 ml	5 ml	5 ml		40 ml	5 ml	5 ml
Active material in							

Wt. %							
Perfume	1.6	1.6	1.6		1.6	1.6	1.6
Any dye or mixture of dyes from Table 1	0	0.006	0		0	0	0.04
TiO <sub>2</sub>	-	-	-		-	0.1	-
Sodium Sulfite	0.4	0.4	0.4		0.3	0.3	0.3
Acusol 305, Rohm&Haas	-				2	-	-
Hydrogenated castor oil	0.14	0.14	0.14		0.14	0.14	0.14
<b>Base Composition 26, 27, 28 or 29</b>	Add to 100%	Add to 100%	Add to 100%		Add to 100%	Add to 100%	Add to 100%

Composition	32				33		
Compartment	A	B	C		A	B	C
Volume of each compartment	40 ml	5 ml	5 ml		40 ml	5 ml	5 ml
Active material in Wt. %							
Perfume	1.6	1.6	1.6		1.6	1.6	1.6
Any dye or mixture of dyes from Table 1	0	0	< 0.05		< 0.01	0	0
TiO <sub>2</sub>	0.1	-	-		-	0.1	-
Sodium Sulfite	0.4	0.4	0.4		0.3	0.3	0.3
Acusol 305, Rohm&Haas	1.2				2	-	-
Hydrogenated castor oil	0.14	0.14	0.14		0.14	0.14	0.14
<b>Base Composition 26, 27, 28, 29</b>	Add to 100%	Add to 100%	Add to 100%		Add to 100%	Add to 100%	Add to 100%

### Example 34

#### 5 Bleach & Laundry Additive Detergent Formulations

Ingredients	A	B	C	D	E	F
-------------	---	---	---	---	---	---

AES <sup>1</sup>	11.3	6.0	15.4	16.0	12.0	10.0
LAS <sup>2</sup>	25.6	12.0	4.6	-	-	26.1
MEA-HSAS <sup>3</sup>	-	-	-	3.5	-	-
DTPA: Diethylene triamine pentaacetic acid	0.51	-	1.5	-	-	2.6
4,5-Dihydroxy-1,3-benzenedisulfonic acid disodium salt	1.82	-	-	-	-	1.4
1,2-propandiol	-	10	-	-	-	15
Copolymer of dimethylterephthalate, 1,2-propylene glycol, methyl capped PEG	2.0					
Poly(ethyleneimine) ethoxylated, PEI600 E20		1.8				
Acrylic acid/maleic acid copolymer			2.9			
Acusol 880 (Hydrophobically Modified Non-Ionic Polyol)				2.0	1.8	2.9
Protease (55mg/g active)	-	-	-	-	0.1	0.1
Amylase (30mg/g active)	-	-	-	-	-	0.02
Perfume	-	0.2	0.03	0.17	-	0.15
Brightener	0.21	-	-	0.15	-	0.18
Any dye or mixture of dyes from Table 1	0.01	0.005	0.006	0.002	0.007	0.008
water, other optional agents/components*	to 100% balance	to 100% balance	to 100% balance	to 100% balance	to 100% balance	to 100% balance

\*Other optional agents/components include suds suppressors, structuring agents such as those based on Hydrogenated Castor Oil (preferably Hydrogenated Castor Oil, Anionic Premix), solvents and/or Mica pearlescent aesthetic enhancer.

### Raw Materials and Notes For Composition Examples

All examples show dye Example 5 from table 1. This dye can be replaced or used in admixture with any other dye of the specified structure, particularly any dye from Examples 1 to 28 from Table 1.

- 5 LAS is linear alkylbenzenesulfonate having an average aliphatic carbon chain length  $C_9$ - $C_{15}$ . (HLAS is acid form).

$C_{12-14}$  Dimethylhydroxyethyl ammonium chloride.

AE3S is  $C_{12-15}$  alkyl ethoxy (3) sulfate.

- AE7 is  $C_{12-15}$  alcohol ethoxylate, with an average degree of ethoxylation of 7. AES is  $C_{10-18}$  alkyl  
10 ethoxy sulfate..

AE9 is  $C_{12-13}$  alcohol ethoxylate, with an average degree of ethoxylation of 9.

HSAS or HC1617HSAS is a mid-branched primary alkyl sulfate with average carbon chain length of about 16-17.

Polyacrylate MW 4500 is supplied by BASF, Ludwigshafen, Germany

- 15 Carboxymethyl cellulose is Finnfix® V supplied by CP Kelco, Arnhem, Netherlands

Suitable chelants are, for example, diethylenetetraamine pentaacetic acid (DTPA) or Hydroxyethane di phosphonate (HEDP).

Savinase®, Natalase®, Stainzyme®, Lipex®, Celluclean™, Mannaway® and Whitezyme® are all products of Novozymes, Bagsvaerd, Denmark.

- 20 Proteases may be supplied by Genencor International, Palo Alto, California, USA (e.g. Purafect Prime®) or by Novozymes, Bagsvaerd, Denmark (e.g. Liquanase®, Coronase®).

Fluorescent Brightener 1 is Tinopal® AMS, Fluorescent Brightener 2 is Tinopal® CBS-X.

- Direct Violet 9 is Pergasol® Violet BN-Z.NOBS is sodium  
nonanoyloxybenzenesulfonate. TAED is tetraacetythylenediamineS-ACMC is  
25 carboxymethylcellulose conjugated with C.I. Reactive Blue 19, sold by Megazyme, Wicklow, Ireland under the product name AZO-CM-CELLULOSE.

Soil release agent is Repel-o-tex® PF.

Acrylic Acid/Maleic Acid Copolymer is molecular weight 70,000 and acrylate: maleate ratio 70:30.

- 30 EDDS is sodium salt of Ethylenediamine-N,N'-disuccinic acid.

Suds suppressor agglomerate is supplied by Dow Corning, Midland, Michigan, USA

HSAS is mid-branched alkyl sulfate as disclosed in US 6,020,303 and US 6,060,443

$C_{12-14}$  dimethyl Amine Oxide is supplied by Procter & Gamble Chemicals, Cincinnati, USA

Random graft copolymer is a polyvinyl acetate grafted polyethylene oxide copolymer having a polyethylene oxide backbone and multiple polyvinyl acetate side chains. The molecular weight of the polyethylene oxide backbone is about 6000 and the weight ratio of the polyethylene oxide to polyvinyl acetate is about 40:60 and no more than 1 grafting point per 50 ethylene oxide units.

- 5 Ethoxylated polyethyleneimine is polyethyleneimine (MW = 600) with 20 ethoxylate groups per -NH.

Cationic cellulose polymer is LK400, LR400 and/or JR30M from Amerchol Corporation.

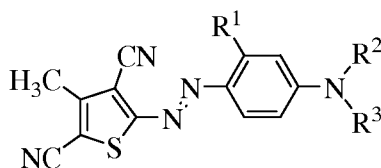
Note: all enzyme levels are expressed as % enzyme raw material

- 10 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

What is claimed is:

1. A laundry care composition comprising a laundry care adjunct and from 0.00001 wt% to 0.5 wt% thiophene azo carboxylate dye or mixtures thereof having the structure of Formula I:



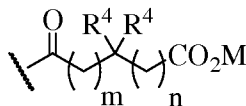
Formula I

wherein  $R^1$  is selected from the group consisting of H and electron-withdrawing groups, preferred electron-withdrawing groups being selected from the group consisting of F, Cl, Br, most preferably Cl; wherein  $R^2$  is  $(CH_2CH_2O)_yQ$  and  $R^3$  is  $(CH_2CH_2O)_{y'}Q'$ ;

wherein  $y$  and  $y'$  are integers independently selected from 1 to 39,

wherein  $8 \leq (y + y') \leq 40$ , preferably  $(y + y') \leq 35$ , more preferably  $(y + y') \leq 30$ ;

wherein  $Q$  and  $Q'$  are independently selected from the group consisting of H and  $Y$  wherein  $Y$  is as defined below; with the proviso that the dye comprises at least one  $Q$  or  $Q'$  group that is  $Y$ , preferably  $Q$  and  $Q'$  are each an independently selected  $Y$ ; and wherein  $Y$  is an organic radical represented by Formula II



Formula II

wherein independently for each  $Y$  group,

$M$  is H or a charge balancing cation;  $m$  is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1;  $n$  is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; the sum of  $m + n$  is 1 to 10, preferably 1, 2 or 3, more preferably 1 or 2; each  $R^4$  is independently selected from the group consisting of H,  $C_{3-18}$  or  $C_4-C_{18}$  linear or branched alkyl,  $C_{3-18}$  or  $C_4-C_{18}$  linear or branched alkenyl, and mixtures thereof, and wherein at least one  $R^4$  group is not H, and preferably wherein  $0.4(y + y') \leq$ , more preferably  $0.6(y + y') \leq$  the sum of the number of carbon atoms in all the  $R^4$  groups  $\leq 2.0(y + y')$ , more preferably  $\leq 1.8(y + y')$ , most preferably  $\leq 1.6(y + y')$ , and mixtures thereof.

2. A laundry care composition according to claim 1 wherein in the dye structure of Formula I,  $R^1$  comprises H or an electron-withdrawing group, preferably Cl.



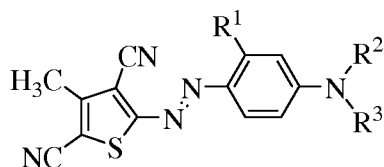
3. A laundry care composition according to claim 2 wherein in the dye structure of Formula I,  $R^1$  is H.
4. A laundry care composition according to any preceding claim wherein the laundry care adjunct comprises a first wash lipase.
5. A laundry care composition according to any preceding claim wherein the laundry care adjunct comprises a fluorescent agent selected from: sodium 2 (4-styryl-3-sulfophenyl) -2H-naphthol [1,2 - d]triazole, 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- sulfostyryl) biphenyl, preferably in an amount of from 0.005 to 2 wt% of the laundry care composition.
6. A laundry care composition according to any preceding claim wherein the laundry care adjunct comprises a dye transfer inhibitor selected from the group consisting of:
  - (a) polyvinylpyrrolidone polymers; or
  - (b) polyamine N-oxide polymers; or
  - (c) copolymers of N-vinylpyrrolidone and N-vinylimidazole; or
  - (d) polyvinylloxazolidones; or
  - (e) polyvinylimidazoles; or
  - (f) mixtures thereof.
7. A laundry care composition according to any preceding claim wherein the laundry care adjunct comprises a soil suspension polymer selected from the group comprising:
  - (a) amphiphilic alkoxyated polyamines; or
  - (b) amphiphilic graft co-polymers; or
  - (c) zwitterionic soil suspension polymer; or
  - (d) mixtures thereof.
8. A laundry care composition according to any preceding claim wherein the thiophene azo dye has a molecular weight from greater than 760 Daltons, from 825 Daltons to 5000 Daltons, from 1000 Daltons to 2500 Daltons, or even from 1250 Daltons to 2000 Daltons.

9. A laundry care composition according to any preceding claim in the form of a unit dose product such as a pouch, preferably a multi-compartment unit dose product.

10. A laundry care composition according to any preceding claim comprising, based on total laundry care composition weight, a total of no more than 20% water; a total of no more than 15% water; a total of no more than 10% water; or even a total of no more than 5% water, preferably comprising in addition from 10% to 70% of a water-miscible organic solvent having a molecular weight of greater than 70 Daltons.

11. A laundry care composition according to any preceding claim comprising, based on total laundry care composition weight, a perfume microcapsule comprising a core and a shell that encapsulates said core, said perfume microcapsule having a D[4,3] average particle of from about 0.01 microns to about 200 microns.

12. A method of treating a textile, the method comprising the steps of (i) treating the textile with an aqueous solution comprising a laundry care adjunct and from 1 ppb to 100 ppm of a thiophene azo carboxylate dye or mixtures thereof; and (ii) rinsing and drying the textile, the dye comprising a thiophene azo carboxylate dye having the structure of Formula I:



Formula I

wherein  $R^1$  is selected from the group consisting of H and electron-withdrawing groups, preferred electron-withdrawing groups being selected from the group consisting of F, Cl, Br, most preferably Cl;

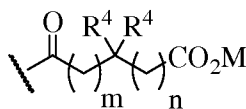
wherein  $R^2$  is  $(CH_2CH_2O)_yQ$  and  $R^3$  is  $(CH_2CH_2O)_{y'}Q'$ ;

wherein  $y$  and  $y'$  are integers independently selected from 1 to 39,

wherein  $8 \leq (y + y') \leq 40$ , preferably  $(y + y') \leq 35$ , more preferably  $(y + y') \leq 30$ ;

wherein  $Q$  and  $Q'$  are independently selected from the group consisting of H and  $Y$  wherein  $Y$  is as defined below; with the proviso that the dye comprises at least one  $Q$  or  $Q'$  group that is  $Y$ , preferably  $Q$  and  $Q'$  are each an independently selected  $Y$ ; and wherein  $Y$  is an organic radical represented by Formula II

58



Formula II

wherein independently for each Y group,

M is H or a charge balancing cation; m is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; n is 0 to 5, preferably 0, 1, 2 or 3, more preferably 0 or 1; the sum of m + n is 1 to 10, preferably 1, 2 or 3, more preferably 1 or 2; each R<sup>4</sup> is independently selected from the group consisting of H, C<sub>3-18</sub> or C<sub>4-18</sub> linear or branched alkyl, C<sub>3-18</sub> or C<sub>4-18</sub> linear or branched alkenyl, and mixtures thereof, and wherein at least one R<sup>4</sup> group is not H, and preferably wherein 0.4(y + y') ≤, more preferably 0.6(y + y') ≤ the sum of the number of carbon atoms in all the R<sup>4</sup> groups ≤ 2.0(y + y'), more preferably ≤ 1.8(y + y'), most preferably ≤ 1.6(y + y'), and mixtures thereof.

13. A method according to claim 12 wherein the textile comprises polyester and/or nylon and/or cellulosic textile, in single or blended textiles.

14. Use of a laundry care composition according any of claims 1 to 11 for treating a polyester and/or nylon-comprising textile, preferably additionally comprising cellulosic textile.

15. A method or composition according to any preceding claim in which the dye comprises at least one dye having a structure as shown in Table 1 herein.

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/056186

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> INV. C11D3/40      C11D3/42      C09B29/033      C09B29/08 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) C11D C09B		
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		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/166584 A1 (MILLIKEN & CO) 6 December 2012 (2012-12-06) page 1, line 13 - line 24; claims; examples; tables 1-5 -----	1-15
X	WO 2012/166768 A1 (PROCTER & GAMBLE) 6 December 2012 (2012-12-06) cited in the application page 1, line 8 - line 23; claims; examples 27, 28 -----	1-15
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<input type="checkbox"/> Further documents are listed in the continuation of Box C. <span style="margin-left: 100px;"><input checked="" type="checkbox"/> See patent family annex.</span>		
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Date of the actual completion of the international search  <div style="text-align: center; font-size: 1.2em;">19 November 2014</div>		Date of mailing of the international search report  <div style="text-align: center; font-size: 1.2em;">27/11/2014</div>
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer  <div style="text-align: center; font-size: 1.2em;">Hillebrecht, Dieter</div>

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