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## (54) Title: COMPOSITIONS FOR TREATING THE HAIR

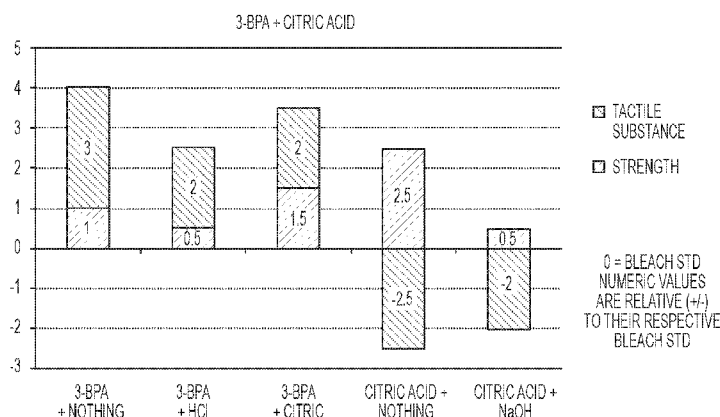


FIG. 1

(57) Abstract: The disclosure relates to compositions for treating keratinous substrates, such as the hair, comprising 3-butoxypropylamine and at least one carboxylic acid, as well as systems and methods for treating keratinous substrates with the compositions.



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## COMPOSITIONS FOR TREATING THE HAIR

### TECHNICAL FIELD

[001] The present disclosure relates to compositions for use in treating keratinous substrates, such as the hair.

### BACKGROUND

[002] It is known that consumers desire to use cosmetic and care compositions that enhance the appearance of keratinous substrates such as hair, e.g., by changing the color, style, and/or shape of the hair, and/or by imparting various properties to hair, such as shine and conditioning. Many of the known compositions and processes for enhancing the appearance of the hair involve chemical treatment of the hair.

[003] The process of changing the color of hair, for example, can involve depositing an artificial color onto the hair which provides a different shade or color to the hair, and/or lifting the color of the hair, such as lightening the color of dark hair to lighter shades. The process of lifting the color of hair, also known as lightening, generally requires the use of compositions that comprise at least one oxidizing agent.

[004] Lightening or lifting the color of the hair is typically evaluated by the variation in tone height before and after the application of a hair color-altering composition onto hair. This variation corresponds to the degree or level of lightening or lift. The notion of “tone” is based on the classification of the natural shades, one tone separating each shade from the shade immediately following or preceding it, which is well known to hairstyling professionals. The tone heights or levels range from 1 (black) to 10 (light blond), one unit corresponding to one tone; thus, the higher the number, the lighter the shade or the greater the degree of lift.

[005] In general, hair lightening or color lifting compositions and hair dyeing compositions possess an alkalinity such that these compositions have a pH value of above 7, typically being at pH 9 and above, and may generally require the presence of an alkalizing agent such as ammonia or an ammonia gas generating compound and/or an amine or ammonium-based compound in amounts sufficient to make such compositions alkaline. The alkalizing agent causes the hair shaft to swell, thus allowing the small oxidative dye molecules to penetrate the cuticle and cortex before the oxidation condensation process is completed. The resulting

larger-sized colored complexes from the oxidative reaction are then trapped inside the hair fiber, thereby permanently altering the color of the hair.

**[006]** Additionally, there are many techniques and compositions for styling or altering the shape of hair. For example, hair care products referred to as “hair relaxers” or “hair straighteners” can relax or straighten curly or kinky hair, including wavy hair. Straightening or relaxing the curls of very curly hair may increase the manageability and ease of styling of such hair. Compositions for permanent waving the hair will impart a curl or a wave to otherwise straight hair. Different types of compositions can be applied onto hair in order to change its shape and make it more manageable, such as alkaline and acidic compositions. Hair relaxers, straighteners, perms, and/or waves may either be applied in a hair salon by a professional or in the home by the individual consumer.

**[007]** While dyeing or color lifting compositions can effectively alter the color of hair, and relaxing, straightening, perming, and waving compositions can effectively alter the shape of the hair, these chemical treatments can damage the hair fibers and/or irritate the scalp. Thus, in order to reduce or avoid the drawbacks mentioned above, as well as to improve the cosmetic performance of the compositions, the use of new and additional components and novel combinations of ingredients are continuously sought.

**[008]** However, the choice of components or combinations of ingredients could pose difficulties insofar as they cannot be detrimental to other cosmetic attributes such as ease and uniformity of application, rheology or viscosity properties and stability of the compositions, color deposit and target shade formation, and/or result into more disadvantages such as increased damage or a less healthy look to the hair. It would therefore be desirable to provide the consumer with compositions and methods that can treat the hair, e.g. lift the color of hair and/or deposit color onto hair in an efficient manner, while providing other cosmetic advantages such as shine, conditioning, fiber strength, and/or a healthy appearance to the hair, but avoiding or minimizing damage to the hair.

**[009]** Further, both natural and sensitized or chemically treated hair can contain several kinds of negatively charged moieties, for example, carboxylates (resulting from the hydrolysis of amino acids and thioester bonds) and/or sulfonates (resulting from the oxidation of disulfide bonds). These negatively charged moieties can degrade the cosmetic properties of the hair.

**[0010]** Moreover, when hair is chemically treated or damaged, the disulfide bonds in hair (disulfide linkages between two cysteine units) can be reduced or broken, resulting in the formation of thiol groups and/or cysteic acid. Cysteine bridges, or disulfide bonds, are the

strongest bonds present in the internal network of hair and play a key role in hair strength. Cosmetic treatments, such as bleaching, straightening, or permanent waving the hair, can permanently alter these bonds leading to the formation of cysteic acid. As such, increased amounts of cysteic acid in the hair suggest that the hair is damaged.

**[0011]** Thus, one objective of the disclosure is to provide novel compositions that can provide advantageous effects such as strengthening of the hair fiber, protecting hair fibers from damage or further damage, enhanced properties such as softness, shine, conditioning, healthy appearance, while at the same time, providing desired effects such as coloring, lightening, straightening, relaxing, and/or shaping.

### SUMMARY

**[0012]** The present disclosure relates to compositions and systems for treating keratinous substrates, such as the hair, as well as methods for treating keratinous substrates with the compositions and systems disclosed herein.

**[0013]** According to various embodiments, the disclosure relates to hair treatment compositions comprising 3-butoxypropylamine (3-BPA) and at least one carboxylic acid. The treatment compositions may optionally be used in conjunction with chemical treatments such as compositions or agents for altering the color or shape of the hair, including hair coloring or hair lightening compositions, or hair-shaping compositions for straightening, relaxing, and/or permanent waving the hair, or may be used with compositions for treating the hair that are not color- or shape-altering compositions. The treatment compositions may also optionally be applied directly to the hair, and/or may be mixed with water or other solvent or composition and applied to the hair.

**[0014]** The disclosure further relates to hair conditioning compositions comprising 3-butoxypropylamine and at least one carboxylic acid. In further embodiments, the disclosure relates to hair treatment systems comprising the treatment compositions and conditioning compositions according to the disclosure, and use of the systems in conjunction with compositions for altering the color and/or shape of the hair.

**[0015]** Exemplary methods comprise applying the treatment composition according to the disclosure to the hair before, during, and/or after application of a color-altering composition to the hair. Further exemplary methods comprise applying a conditioning composition according to the disclosure to the hair after application of the treatment composition. Methods according to the disclosure may provide for cosmetic advantages such as shine, conditioning, fiber strength, and/or a healthy appearance to the colored hair, and/or avoiding

or minimizing damage to the hair that may otherwise occur with processes for altering hair either by coloring, lightening or other chemical processes.

**[0016]** Further exemplary methods comprise applying the treatment composition according to the disclosure to the hair before, during, and/or after application of a hair shaping composition to the hair. Methods according to the disclosure may provide for cosmetic advantages such as shine, conditioning, fiber strength, and/or a healthy appearance to the shaped hair, and minimizing damage to the hair that may otherwise occur with processes for altering hair either by shaping or other chemical processes.

**[0017]** Further exemplary methods comprise applying the treatment composition according to the disclosure to the hair before, during, and/or after application of a composition that is not a color- or shape-altering composition to the hair. Still further exemplary methods comprise applying the treatment composition according to the disclosure to the hair before, during, and/or after application of water or other solvent to the hair. Methods according to the disclosure may provide for cosmetic advantages such as shine, conditioning, fiber strength, and/or a healthy appearance to the shaped hair, and minimizing damage to the hair.

**[0018]** According to various embodiments, exemplary hair treatment systems comprise treatment compositions comprising 3-butoxypropylamine and at least one carboxylic acid; conditioning compositions comprising 3-butoxypropylamine and at least one carboxylic acid; and optionally a composition or agent for altering the color or shape of the hair. In some embodiments, the at least one carboxylic acid in the treatment composition and the conditioning composition of the systems are the same. In other embodiments, the at least one carboxylic acid in the treatment composition and the conditioning composition of the systems are different.

**[0019]** According to various embodiments, kits for treating the hair may comprise: a first compartment containing a treatment composition comprising 3-butoxypropylamine and at least one carboxylic acid; and a second compartment containing a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid.

**[0020]** In further embodiments, kits for treating the hair or for altering the color of hair may comprise: a first compartment containing a treatment composition comprising 3-butoxypropylamine and at least one carboxylic acid, and optionally a composition or agent for altering the color of the hair; and a second compartment containing a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid. In yet further embodiments, kits for treating the hair or altering the color of hair may comprise: a first compartment containing a treatment composition comprising 3-butoxypropylamine and at

least one carboxylic acid; a second compartment containing a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid; and one or more additional compartments containing one or more agents or compositions for altering the color of the hair.

**[0021]** In further embodiments, kits for treating the hair or for altering the shape of hair may comprise: a first compartment containing a treatment composition comprising 3-butoxypropylamine and at least one carboxylic acid, and optionally a composition or agent for altering the shape of the hair; and a second compartment containing a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid. In still further embodiments, kits for treating the hair or altering the shape of hair may comprise: a first compartment containing a treatment composition comprising 3-butoxypropylamine and at least one carboxylic acid; and a second compartment containing a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid; and one or more additional compartments containing one or more agents or compositions for altering the shape of the hair.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0022]** The present disclosure and claims can be better understood from the following detailed description either alone or together with the accompanying drawings. The drawings are included to provide a further understanding, and are incorporated in and constitute a part of this specification. The drawings illustrate one or more exemplary embodiments of the present disclosure and together with the description serve to explain various principles and operation.

**[0023]** FIGS. 1-5 show sensorial data comparing strength and tactile substance for hair samples treated with a bleaching composition containing a hair treatment composition according to an embodiment of the disclosure containing 3-BPA and carboxylic acid relative to hair samples treated with 3-BPA alone, 3-BPA pH adjusted, carboxylic acid alone, and carboxylic acid pH adjusted, where the baseline (0) is a standard hair bleaching formulation with no additive.

**[0024]** FIG. 1 shows the sensorial comparison for 3-BPA and citric acid.

**[0025]** FIG. 2 shows the sensorial comparison for 3-BPA and malonic acid.

**[0026]** FIG. 3 shows the sensorial comparison for 3-BPA and malic acid.

**[0027]** FIG. 4 shows the sensorial comparison for 3-BPA and maleic acid.

**[0028]** FIG. 5 shows the sensorial comparison for 3-BPA and oxalic acid.

## DETAILED DESCRIPTION

[0029] Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients and/or reaction conditions are to be understood as being modified in all instances by the term “about” which can encompass  $\pm 10\%$ ,  $\pm 8\%$ ,  $\pm 6\%$ ,  $\pm 5\%$ ,  $\pm 4\%$ ,  $\pm 3\%$ ,  $\pm 2\%$ ,  $\pm 1\%$ , or  $\pm 0.5\%$ .

[0030] All numbers expressing pH values are to be understood as being modified in all instances by the term “about” which encompasses up to  $\pm 3\%$ .

[0031] “At least one” as used herein means one or more and thus includes individual components as well as mixtures/combinations.

[0032] A “chemical treatment” composition as described herein may include any composition for chemically treating the hair, such as by way of non-limiting example, permanent waving, relaxing, straightening, oxidation dyeing, coloring, and lightening (e.g., bleaching, highlighting) the hair. The terms “chemical treatment composition,” “color-altering composition,” and “shape-altering composition,” as well as variations thereof, may be used interchangeably herein without limitation.

[0033] “Systems” as used herein are meant to comprise treatment compositions according to the disclosure and conditioning compositions according to the disclosure.

[0034] The term “altering the color” or “color-altering” as used herein may refer to lifting or lightening the color of hair. It can also refer to dyeing or coloring hair or depositing color onto the hair. In certain instances, it refers to lifting or lightening the color of hair and depositing color onto the hair in one treatment.

[0035] The term “strength” as used herein may refer to the strength of the hair fiber with respect to the ease or difficulty of breaking a hair fiber, or to the amount of effort or force needed to break the fiber when the fiber is subjected to a pulling, tugging, stretching, combing, or brushing action.

[0036] The term “protecting” as used herein may refer to the prevention, minimization, or reduction of damage or further damage to hair.

[0037] “Hydrocarbons,” as used herein, include alkanes, alkenes, and alkynes, wherein the alkanes comprise at least one carbon, and the alkenes and alkynes each comprise at least two carbons; further wherein the hydrocarbons may be chosen from linear hydrocarbons, branched hydrocarbons, and cyclic hydrocarbons; further wherein the hydrocarbons may optionally be substituted; and further wherein the hydrocarbons may optionally further comprise at least one heteroatom intercalated in the hydrocarbon chain.



**[0038]** “Substituted,” as used herein, means comprising at least one substituent. Non-limiting examples of substituents include atoms, such as oxygen atoms and nitrogen atoms, as well as functional groups, such as hydroxyl groups, ether groups, alkoxy groups, acyloxyalkyl groups, oxyalkylene groups, polyoxyalkylene groups, carboxylic acid groups, amine groups, acylamino groups, amide groups, halogen containing groups, ester groups, thiol groups, sulphonate groups, thiosulphate groups, siloxane groups, and polysiloxane groups. The substituent(s) may be further substituted.

**[0039]** “Polymers,” as defined herein, include homopolymers and copolymers formed from at least two different types of monomers.

**[0040]** “(Meth)acrylic” as used herein, is understood to mean, within the meaning of the present patent application, “acrylic or methacrylic”.

**[0041]** The term “neutralized” as used herein is intended to mean that the 3-butoxypropylamine is protonated with a  $H^+$  (proton) coming from the carboxylic acid(s).

**[0042]** The term “substantially free of (a component)” as defined herein means that the system or composition contains no appreciable amount of the component, for example, no more than about 1% by weight, no more than about 0.5% by weight, or no more than about 0.3% by weight, such as no more than about 0.1% by weight, based on the weight of the composition.

**[0043]** The term “free” or “completely free of (a component)” as defined herein means that the composition does not contain the component in any measurable degree by standard means.

**[0044]** As used herein, a carboxylic acid is described as being present in a composition regardless of whether the carboxylic acid is present in acid form or whether the acid is dissociated or forms a salt thereof, e.g. upon mixing with a solution or other formulation. Accordingly, if a composition (e.g. a treatment composition, a conditioning composition, or a composition for altering the color or shape of the hair) is described herein as comprising an acid, or comprising a certain amount of an acid, but the acid is dissociated or forms a salt in the composition, the description is intended to refer to the acid or amount thereof present before the dissociation or salt formation. By way of example only, if a treatment composition comprising 3-butoxypropylamine and maleic acid is mixed with a liquid hair bleaching composition, and in the hair bleaching composition the maleic acid forms a salt of maleic acid so that no or substantially no maleic acid is present in the mixture, any reference to the hair bleaching composition comprising maleic acid or a particular amount of maleic acid is intended to refer to the maleic acid or amount thereof present in the treatment composition before it is mixed with the hair bleaching composition.

## **TREATMENT COMPOSITIONS**

[0045] As described herein, the disclosure relates to treatment compositions comprising 3-butoxypropylamine (3-BPA) and at least one carboxylic acid. The treatment compositions can further comprise additional components, such as solvents. In some embodiments, the treatment composition consists essentially of 3-BPA, one or more carboxylic acids, one or more solvents, and one or more coloring agents. In various embodiments, the treatment composition consists essentially of 3-BPA, one or more carboxylic acids, and one or more solvents. In a further embodiment, the treatment composition consists of 3-BPA, one or more carboxylic acids, and one or more solvents. In various embodiments, the treatment composition consists essentially of 3-BPA, one or more carboxylic acids, one or more solvents, and one or more coloring agents.

### **3-butoxypropylamine**

[0046] The 3-butoxypropylamine (3-BPA) may be present in the treatment composition in an amount up to about 20%, such as up to about 19%, up to about 18%, up to about 17%, up to about 16%, up to about 15%, up to about 14%, up to about 13%, up to about 12%, up to about 11%, up to about 10%, up to about 9%, up to about 8%, up to about 7%, up to about 6%, up to about 5%, up to about 4%, up to about 3%, up to about 2%, up to about 1%, up to about 0.5%, or up to about 0.1% by weight, based on the weight of the treatment composition. By way of non-limiting example only, the 3-BPA may be present in an amount ranging from about 0.0001% to about 20%, such as about 0.001% to about 15%, from about 5 wt% to about 15 wt% 3-BPA, such as from about 6 wt% to about 14 wt%, from about 7 wt% to about 13 wt%, or from about 8 wt% to about 12 wt% 3-BPA, based on the total weight of the treatment composition. By way of example only, the 3-BPA may be present in an amount ranging from about 10 wt% to about 13 wt%, such as about 11 wt% to about 13 wt%, or about 12 wt% to about 13 wt%.

### **Carboxylic Acids**

[0047] The treatment compositions according to the disclosure may comprise at least one carboxylic acid. According to the disclosure, useful carboxylic acids include organic compounds that include, for example, one, two, three, or more carboxylic acid functional groups (COOH) and at least one carbon atom.

[0048] In certain exemplary, and non-limiting embodiments, the at least one carboxylic acid

may be chosen from saturated or unsaturated, substituted or unsubstituted dicarboxylic acids, salts thereof, and mixtures thereof. By way of non-limiting example, the at least one carboxylic acid may be chosen from dicarboxylic acids of the following formula:



wherein:

-R is a cyclic or acyclic, saturated or unsaturated, linear or branched, C<sub>1</sub>-C<sub>100</sub> hydrocarbon moiety comprising from 0 to 30 double and/or triple bonds and/or from 0 to 10 rings, and optionally interrupted by 1 to 30 heteroatoms chosen from O, N and S, and optionally substituted with 1 to 30 substituents chosen from a hydrogen atom, a hydroxyl (-OH) moiety, an amino (-NH<sub>2</sub>) moiety, a (C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a poly(C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a hydroxy(C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a polyhydroxy(C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a C<sub>6</sub>-C<sub>30</sub> aryl moiety, and in some embodiments -R may be omitted; and

-X and X', independently denote a hydrogen atom, an ammonium ion, a ion of an alkali metal such as Li, Na, K, or an alkaline earth metal such as Be, Mg, Ca or an ion derived from an organic amine such as an alkylamine.

**[0049]** It is understood that the expression cyclic hydrocarbon moiety for the purposes of the present application is understood to mean a hydrocarbon moiety consisting of one or more rings or comprising one or more rings which are pendent or in the principle chain, it being possible for the rings to be saturated or unsaturated and to be substituted with one or more C<sub>1</sub>-C<sub>30</sub> alkyl or alkenyl or hydroxyl or amino moieties.

**[0050]** By way of non-limiting example only, useful carboxylic acids may include oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, maleic acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, as well as combinations thereof. In at least one embodiment, the treatment composition comprises at least one carboxylic acid chosen from malonic acid and maleic acid, and optionally at least one additional carboxylic acid.

**[0051]** The at least one carboxylic acid may be present in the treatment composition in an amount up to about 50%, such as up to about 45%, up to about 40%, up to about 35%, up to about 30%, up to about 29%, up to about 28%, up to about 27%, up to about 26%, up to about 25%, up to about 24%, up to about 23%, up to about 22%, up to about 21%, up to

about 20%, up to about 19%, up to about 18%, up to about 17%, up to about 16%, up to about 15%, up to about 14%, up to about 13%, up to about 12%, up to about 11%, up to about 10%, up to about 9%, up to about 8%, up to about 7%, up to about 6%, up to about 5%, up to about 4%, up to about 3%, up to about 2%, up to about 1%, up to about 0.5%, or up to about 0.1% by weight, based on the weight of the treatment composition. By way of non-limiting example only, the at least one carboxylic acid may be present in an amount ranging from about 0.01% to about 30%, such as about 0.1% to about 25%, about 1% to about 20%, about 5% to about 15%, about 8% to about 14%, or about 8% to about 12% by weight, based on the weight of the treatment composition. In one exemplary embodiment, the at least one carboxylic acid may be present in an amount ranging from about 5% to about 25%, such as about 2% to about 10% or about 8% to about 23% by weight, based on the weight of the treatment composition. For example, the at least one carboxylic acid may be present in an amount ranging from about 5% to about 15%, about 8% to about 14%, such as about 10% to about 11%, about 12% to about 14%, or about 13% to about 14%, such as about 5%, about 6%, about 7%, about 8%, about 9%, about 10%, about 11%, about 12%, about 13%, about 14%, about 15%, about 16%, about 17%, about 18%, about 19%, about 20%, about 21%, about 22%, about 23%, about 24%, or about 25%, by weight, based on the weight of the treatment composition. It should be understood that when more than one carboxylic acid is present, the total amount of carboxylic acids may be present in these amounts.

### **Solvent**

**[0052]** The treatment composition may further comprise at least one solvent. In various exemplary and non-limiting embodiments, the solvent may be chosen from cosmetically acceptable solvents chosen from water, at least one cosmetically acceptable organic solvent, and mixtures thereof.

**[0053]** The organic solvents may be volatile or non-volatile compounds. As examples of organic solvents, non-limiting examples include monoalcohols and polyols such as ethanol, isopropyl alcohol, propyl alcohol, benzyl alcohol, and phenylethanol, or glycols or glycol ethers such as, for example, monomethyl, monoethyl and monobutyl ethers of ethylene glycol, propylene glycol or ethers thereof such as, for example, monomethyl ether of propylene glycol, butylene glycol, hexylene glycol, dipropylene glycol as well as alkyl ethers of diethylene glycol, for example monoethyl ether or monobutyl ether of diethylene glycol.

**[0054]** Other suitable examples of organic solvents are ethylene glycol, propylene glycol, butylene glycol, hexylene glycol, propane diol, and glycerine.

**[0055]** The cosmetically acceptable solvent may comprise an amount ranging up to about 95%, such as up to about 90%, up to about 85%, up to about 80%, up to about 75%, up to about 70%, up to about 65%, up to about 60%, up to about 55%, or up to about 50%, by weight, based on the weight of the treatment composition. For example, the cosmetically acceptable solvent may range from about 65% to about 95% by weight, from about 70% to about 90% by weight, or from about 80% to about 85% by weight, or from about 5% to about 20% by weight, based on the weight of the treatment composition.

**[0056]** Additional components may optionally be present in the treatment composition. By way of example only, the treatment composition may comprise coloring agents (including but not limited to permanent, demi-permanent, or semi-permanent hair coloring agents), pH adjusters, emulsifiers, thickening agents and rheology modifying agents, cationic polymers, humectants and moisturizing agents, chelating agents such as glycine, emulsifying agents, fillers, structuring agents, propellants, anionic surfactants, cationic surfactants, amphoteric surfactants, shine agents, conditioning agents, and strengthening agents.

**[0057]** The pH of the treatment composition may range up to about 7, such as from about 1 to about 6, from about 1 to about 4, such as from about 2 to about 4, such as from about 2 to about 4, about 2.5 to about 3.5, or from about 2 to about 3.

**[0058]** The treatment composition may, in various embodiments, be applied onto the hair within about 24 hours, such as less than 24 hours or less than 12 hours, before or after a composition for altering the color or shape of the hair. In at least certain exemplary embodiments, the treatment composition may be applied to the hair within a few hours or a few minutes before or after the color- or shape-altering composition. For example, the treatment composition may be applied within about 1 to about 6 hours before or after the color- or shape-altering composition, or may be applied up to about 60 minutes, such as up to about 30 minutes, up to about 20 minutes, up to about 10 minutes, up to about 5 minutes, up to about 2 minutes, or up to about 1 minute before or after the color- or shape-altering composition.

**[0059]** In yet further embodiments, the treatment composition may be applied to the hair at the same time or substantially the same time as a color- or shape-altering composition. For example, the treatment composition may be mixed with a color- or shape-altering composition, or may be applied simultaneously with a color- or shape-altering composition. In various exemplary embodiments where the treatment composition is mixed with a color- or shape-altering composition, the pH of the resulting mixture may range, for example, from about 7 to about 12, such as about 8 to about 11, about 9 to about 11, or about 10 to about 11.

[0060] In still further embodiments, the treatment composition may be applied to the hair within about 24 hours, such as less than 24 hours or less than 12 hours, before or after a composition that is not a composition for altering the color or shape of the hair. In at least certain exemplary embodiments, the treatment composition may be applied to the hair within a few hours or a few minutes before or after the composition that is not a composition for altering the color or shape of the hair. For example, the treatment composition may be applied within about 1 to about 6 hours before or after the composition that is not a composition for altering the color or shape of the hair, or may be applied up to about 60 minutes, such as up to about 30 minutes, up to about 20 minutes, up to about 10 minutes, up to about 5 minutes, up to about 2 minutes, or up to about 1 minute before or after the composition that is not a composition for altering the color or shape of the hair.

[0061] In yet further embodiments, the treatment composition may be applied to the hair at the same time or substantially the same time as a composition for treating the hair that is not a color- or shape-altering composition. For example, the treatment composition may be mixed with a composition that is not a composition for altering the color or shape of the hair, or may be applied simultaneously with a composition for treating the hair.

[0062] In a still further embodiment, the treatment composition may be mixed with water and applied to the hair.

[0063] The treatment composition may be left on the hair for a period of time ranging up to one hour, such as from about 3 minutes to about 45 minutes, from about 5 minutes to about 30 minutes, or from about 10 minutes to about 20 minutes. In further embodiments, the treatment composition may be left on the hair for a period up to about 30 minutes, such as, for example, from about 1 to about 30 minutes, about 1 to about 10 minutes, or about 1 to about 5 minutes.

#### **Exemplary Combinations and Amounts of Components**

[0064] According to various embodiments, the treatment composition may include 3-BPA and a combination of carboxylic acids. By way of non-limiting example, the treatment composition may include 3-BPA and a combination of two carboxylic acids, such as malonic acid and citric acid, malonic acid and oxalic acid, malonic acid and maleic acid, malonic acid and malic acid, citric acid and oxalic acid, citric acid and maleic acid, citric acid and malic acid, oxalic acid and maleic acid, oxalic acid and malic acid, maleic acid and malic acid, and so on. In other embodiments, the treatment composition may include 3-BPA and combinations of three or more carboxylic acids.

**[0065]** In some embodiments, the treatment composition may include 3-BPA and one or more saturated carboxylic acids, and may be free or substantially free of unsaturated carboxylic acids. In other embodiments, the treatment composition may include 3-BPA and one or more unsaturated carboxylic acids and be free or substantially free of saturated carboxylic acids. In still other embodiments, the treatment composition may include 3-BPA and both saturated (e.g. oxalic acid, malonic acid, glutaric acid, succinic acid, adipic acid, glycolic acid, citric acid, tartaric acid, malic acid, sebacic acid, glyoxylic acid monohydrate) and unsaturated (maleic acid, fumaric acid, benzoic acid, citraconic acid) carboxylic acids.

**[0066]** In some embodiments the treatment composition may include from about 5 wt% to about 15 wt% 3-BPA, such as from about 8 wt% to about 14 wt%, from about 9 wt% to about 13 wt%, or from about 10 wt% to about 12 wt% 3-BPA, based on the total weight of the treatment composition. In one embodiment, the treatment composition may include from about 11 wt% to about 12 wt% 3-BPA.

**[0067]** In some embodiments, the treatment composition may include from about 8 wt% to about 18 wt% malonic acid. For example, the treatment composition may include from about 9 wt% to about 17 wt%, from about 10 wt% to about 16 wt%, from about 11 wt% to about 15 wt%, from about 12 wt% to about 15 wt%, or about 13 wt% malonic acid.

**[0068]** In various embodiments, the treatment composition may include from about 5 wt% to about 15 wt% maleic acid. For example, the treatment composition may include from about 6 wt% to about 14 wt%, from about 7 wt% to about 13 wt%, from about 8 wt% to about 12 wt%, from about 9 wt% to about 11 wt%, or about 10 wt% to about 11 wt% maleic acid.

**[0069]** In various embodiments, the treatment composition may include from about 10.5 wt% to about 12.5 wt% 3-BPA, and from about 10 wt% to about 15 wt%, such as from about 11 wt% to about 14 wt%, from about 12 wt% to about 13 wt%, or about 13 wt% malonic acid. In other embodiments, the treatment composition may include from about 10.5 wt% to about 12.5 wt% 3-BPA, and from about 9.7 wt% to about 11.7 wt%, such as from about 10 wt% to about 11 wt%, maleic acid.

**[0070]** According to certain embodiments, the total combined amount of 3-BPA and carboxylic acid present in the treatment composition may range up to about 50%, such as from about 0.1% to about 40%, from about 1% to about 35%, about 1% to about 30%, about 2% to about 25%, about 5% to about 25%, or about 8% to about 23% by weight, based on the weight of the treatment composition. In other embodiments, the total combined amount of 3-BPA and carboxylic acid present in the treatment composition may range from about 10 wt% to about 40 wt%, such as from about 15 wt% to about 30 wt%, or from about 20 wt% to

about 25 wt%.

[0071] Without intending to limit the disclosure, it may, in various embodiments, be advantageous to choose certain amounts of the 3-BPA, at least one carboxylic acid, solvent, and/or optionally any additional component in the treatment composition, or ratios of the components in relation to one another, in order to provide or enhance synergistic results from the combinations thereof.

### **COLOR-ALTERING COMPOSITION**

[0072] Before, after, or simultaneously with the treatment composition, a color-altering composition may be applied to the hair. In various exemplary embodiments, the color-altering composition may comprise an agent for bleaching the hair. For example, the color-altering composition may be formed by combining, in a cosmetically acceptable carrier, a bleach composition comprising at least one oxidizing agent chosen from persulfates, perborates, percarbonates, peracids, bromates, their salts and mixtures thereof, and a developer composition comprising hydrogen peroxide. In other embodiments, the oxidizing agent and developer may be separate. In yet further embodiments, the color-altering composition may comprise at least one colorant compound chosen from oxidative dye precursors, direct dyes, pigments, and mixtures thereof.

#### **Bleaching agent**

[0073] According to various embodiments, the color-altering composition may comprise, in a cosmetically acceptable carrier, at least one oxidizing agent chosen from peroxides, persulfates, perborates, percarbonates, peracids, bromates, their salts and mixtures thereof. The at least one oxidizing agent may, optionally, be water-soluble.

[0074] Optional peroxides useful herein include, for example, hydrogen peroxide, magnesium peroxide, PVP-peroxide, calcium peroxide, and sodium peroxide.

[0075] Exemplary, non-limiting persulfates include potassium persulfate, sodium persulfate, and ammonium persulfate. In various embodiments, exemplary oxidizing agents may be chosen from sodium perborate and sodium percarbonate. In further embodiments, exemplary peracids may be chosen from organic peracids having the general formula (I):



wherein, in formula (I), R is chosen from saturated or unsaturated, substituted or



unsubstituted, straight or branched chain, alkyl, aryl or alkaryl groups having from 1 to 22 carbon atoms. In at least some exemplary embodiments, mixtures of two or more oxidizing agents chosen from persulfates, perborates, percarbonates, peracids, bromates, and salts thereof, may be chosen.

[0076] In various embodiments, the at least one bleaching agent is chosen from alkali metal salts of perborates, percarbonates, bromates, and persulfates, such as, for example, ammonium, sodium, and potassium salts.

### **Bleach Composition**

[0077] When the color-altering composition comprises separate bleach and developer compositions, the bleach composition may comprise at least one oxidizing agent chosen from persulfates, perborates, percarbonates, peracids, bromates, their salts, and mixtures thereof, such as those described above. In various embodiments, the at least one oxidizing agent is chosen from alkali metal salts of perborates, percarbonates, bromates, and persulfates, such as, for example, ammonium, sodium, and potassium salts. The bleach composition may also optionally comprise a cosmetically acceptable carrier.

[0078] The at least one oxidizing agent of the bleach compositions according to various embodiments of the disclosure is utilized in an amount sufficient to lighten or “bleach” hair. By way of example only, the at least one oxidizing agent of the bleach composition may be present in an amount ranging from about 10% by weight to about 100% by weight, such as from about 20% to about 90% by weight, from about 30% to about 80% by weight, or from about 40% to about 75% by weight, based on the total weight of the bleach composition. In further embodiments, the at least one oxidizing agent of the bleach composition may be present in an amount ranging from about 5% to about 50%, such as about 10% to about 45%, or about 15% to about 40%. In one exemplary embodiment, the at least one oxidizing agent of the bleach composition may be present in an amount of at least 40% by weight, based on the total weight of the bleach composition.

[0079] The bleach composition may be in any form, such as, for example, in the form of a powder, gel, liquid, foam, lotion, cream, mousse, and emulsion.

[0080] In various exemplary embodiments, the bleach composition may be anhydrous. Optionally, water may be added as an activator, by mixing it with the bleach composition.

[0081] The bleach composition of the present invention may also contain acid and alkali pH adjusters, which are well known in the art in the cosmetic treatment of keratin fibers, such as

hair. Such pH adjusters include, but are not limited to, sodium metasilicate, silicate compounds, citric acid, ascorbic acid, and carbonate compounds.

**[0082]** The pH adjusters may, in various embodiments, be present in the bleach composition in an amount effective to provide the color-altering composition with a pH ranging from about 1 to about 7 when the bleach composition is combined with the developer composition. By way of example, the amount of pH adjuster may be present, in various embodiments, in an amount of at least about 0.01%, such as at least about 0.1%, at least about 0.2%, or at least about 0.5%.

**[0083]** According to one exemplary embodiment, the bleach composition is alkaline, with the pH ranging from about 7, 8, 9, or 10 to about 8, 9, 10, or 11. According to a further exemplary embodiment, the bleach composition has a pH higher than about 7.

**[0084]** When the bleach composition is in powder form, the pH may be measured in a 1% solution in water.

**[0085]** Colorants may also optionally be present in the bleach compositions described herein. The colorants useful according to various embodiments of the disclosure are those colorants that are stable in the bleach composition, and can impart additional toning and coloring to hair. Exemplary hair colorants include, but are not limited to, pigments, liposoluble dyes, direct dyes, nacreous pigments, pearling agents, leuco dyes, optical lightening colorants, natural colorants and optically-variable pigments.

### **Developer Composition**

**[0086]** When the color-altering composition comprises separate bleach and developer compositions, the developer composition comprises hydrogen peroxide. The developer composition may also optionally comprise a cosmetically acceptable carrier.

**[0087]** In various exemplary embodiments, hydrogen peroxide is present in an amount of at least about 1% by weight, based on the total weight of the developer composition. In further embodiments, hydrogen peroxide is present in an amount ranging from about 0.1% to about 80% by weight, such as from about 1.0% to about 75% by weight, or from about 2% to about 10% by weight, based on the total weight of the developer composition. In further exemplary embodiments, the hydrogen peroxide may be present in the developer composition in an amount ranging from about 2% to about 25%, such as about 4% to about 20%, about 6% to about 15%, or about 7% to about 10%.

[0088] The cosmetically acceptable carrier of the developer composition may, for example, be present in an amount ranging from about 0.5% to about 99% by weight, such as from about 5% to about 95% by weight, relative to the total weight of the developer composition.

[0089] The pH of the developer composition can range from about 1 to about 5, such as from about 2 to about 4, and it may be adjusted to the desired value using pH adjusters that are well known in the art in the cosmetic treatment of keratin fibers, including, for example, those described herein.

[0090] The developer composition may be in the form of a powder, gel, liquid, foam, lotion, cream, mousse, and emulsion.

[0091] According to various exemplary embodiments, the developer composition may be anhydrous. Optionally, water may be added as an activator, by mixing it with the developer composition.

[0092] The developer composition may, in various embodiments, comprise additional components such as, for example, at least one auxiliary ingredient chosen from rheology-modifying agents, chelating agents, fatty substances, ceramides, alkoxyaminosilicones, and silanes, and any other component known in the art to be useful in a developer composition.

[0093] In at least one exemplary embodiment, the bleach composition may be mixed with the developer composition to form the color-altering composition right before (e.g. within a few minutes before) applying the color-altering composition onto the hair.

[0094] In one exemplary embodiment, the bleach composition and developer composition may be combined to form the lightening composition in a ratio of bleach composition to developer composition ranging from about 1:1 to about 1:5, such as from about 1:1 to about 1:2, or about 1:2 to about 1:4.

### **Coloring Compounds**

[0095] As described herein, in various exemplary and non-limiting embodiments, color-altering compositions may optionally comprise at least one colorant compound chosen from oxidation dyes, direct dyes, pigments, and mixtures thereof.

[0096] The oxidation dyes are generally chosen from one or more oxidation bases optionally combined with one or more couplers.

[0097] By way of example, the oxidation bases may be chosen from *para*-phenylenediamines, bis(phenyl)alkylenediamines, *para*-aminophenols, *ortho*-aminophenols and heterocyclic bases, and the addition salts thereof.

[0098] Among the *para*-phenylenediamines that may be mentioned, for example, are *para*-

phenylenediamine, para-toluenediamine, 2-chloro-para-phenylenediamine, 2,3-dimethyl-para-phenylenediamine, 2,6-dimethyl-para-phenylenediamine, 2,6-diethyl-para-phenylenediamine, 2,5-dimethyl-para-phenylenediamine, N,N-dimethyl-para-phenylenediamine, N,N-diethyl-para-phenylenediamine, N,N-dipropyl-para-phenylenediamine, 4-amino-N,N-diethyl-3-methylaniline, N,N-bis( $\beta$ -hydroxyethyl)-para-phenylenediamine, 4-N,N-bis( $\beta$ -hydroxyethyl)amino-2-methylaniline, 4-N,N-bis( $\beta$ -hydroxyethyl)amino-2-chloroaniline, 2- $\beta$ -hydroxyethyl-*para*-phenylenediamine, 2-methoxymethyl-*para*-phenylenediamine, 2-fluoro-para-phenylenediamine, 2-isopropyl-para-phenylenediamine, N-( $\beta$ -hydroxypropyl)-para-phenylenediamine, 2-hydroxymethyl-para-phenylenediamine, N,N-dimethyl-3-methyl-para-phenylenediamine, N-ethyl-N-( $\beta$ -hydroxyethyl)-para-phenylenediamine, N-( $\beta,\gamma$ -dihydroxypropyl)-para-phenylenediamine, N-(4'-aminophenyl)-para-phenylenediamine, N-phenyl-para-phenylenediamine, 2- $\beta$ -hydroxyethyloxy-para-phenylenediamine, 2- $\beta$ -acetylaminioethyloxy-para-phenylenediamine, N-( $\beta$ -methoxyethyl)-para-phenylenediamine, 4-aminophenylpyrrolidine, 2-thienyl-para-phenylenediamine, 2- $\beta$ -hydroxyethylamino-5-aminotoluene and 3-hydroxy-1-(4'-aminophenyl)pyrrolidine, and the addition salts thereof with an acid.

**[0099]** Among the para-phenylenediamines mentioned above, para-phenylenediamine, para-toluenediamine, 2-isopropyl-para-phenylenediamine, 2- $\beta$ -hydroxyethyl-para-phenylenediamine, 2- $\beta$ -hydroxyethyloxy-para-phenylenediamine, 2,6-dimethyl-para-phenylenediamine, 2,6-diethyl-para-phenylenediamine, 2,3-dimethyl-para-phenylenediamine, N,N-bis( $\beta$ -hydroxyethyl)-para-phenylenediamine, 2-chloro-para-phenylenediamine and 2- $\beta$ -acetylaminioethyloxy-para-phenylenediamine, and the addition salts thereof with an acid, are particularly preferred.

**[00100]** Among the bis(phenyl)alkylenediamines that may be mentioned, for example, are N,N'-bis( $\beta$ -hydroxyethyl)-N,N'-bis(4'-aminophenyl)-1,3-diaminopropanol, N,N'-bis( $\beta$ -hydroxyethyl)-N,N'-bis(4'-aminophenyl)ethylenediamine, N,N'-bis(4'-aminophenyl)tetramethylenediamine, N,N'-bis( $\beta$ -hydroxyethyl)-N,N'-bis(4'-aminophenyl)tetramethylenediamine, N,N'-bis(4-methylaminophenyl)tetramethylenediamine, N,N'-bis(ethyl)-N,N'-bis(4'-amino-3'-methylphenyl)ethylenediamine and 1,8-bis(2,5-diaminophenoxy)-3,6-dioxaoctane, and the addition salts thereof.

**[00101]** Among the para-aminophenols that may be mentioned, for example, are para-aminophenol, 4-amino-3-methylphenol, 4-amino-3-fluorophenol, 4-amino-3-chlorophenol, 4-amino-3-hydroxymethylphenol, 4-amino-2-methylphenol, 4-amino-2-hydroxymethylphenol,

4-amino-2-methoxymethylphenol, 4-amino-2-aminomethylphenol, 4-amino-2-( $\beta$ -hydroxyethylaminomethyl)phenol and 4-amino-2-fluorophenol, and the addition salts thereof with an acid.

**[00102]** Among the ortho-aminophenols that may be mentioned, for example, are 2-aminophenol, 2-amino-5-methylphenol, 2-amino-6-methylphenol and 5-acetamido-2-aminophenol, and the addition salts thereof.

**[00103]** Among the heterocyclic bases that may be mentioned, for example, are pyridine derivatives, pyrimidine derivatives and pyrazole derivatives.

**[00104]** Among the pyridine derivatives that may be mentioned are the compounds described, for example, in patents GB 1 026 978 and GB 1 153 196, for instance 2,5-diaminopyridine, 2-(4-methoxyphenyl)amino-3-aminopyridine and 3,4-diaminopyridine, and the addition salts thereof.

**[00105]** Other pyridine oxidation bases can include the 3-aminopyrazolo[1,5-a]pyridine oxidation bases or the addition salts thereof described, for example, in patent application FR 2 801 308. Examples that may be mentioned include pyrazolo[1,5-a]pyrid-3-ylamine, 2-acetylaminopyrazolo[1,5-a]pyrid-3-ylamine, 2-morpholin-4-ylpyrazolo[1,5-a]pyrid-3-ylamine, 3-aminopyrazolo[1,5-a]pyridine-2-carboxylic acid, 2-methoxypyrazolo[1,5-a]pyrid-3-ylamine, (3-aminopyrazolo[1,5-a]pyrid-7-yl)methanol, 2-(3-aminopyrazolo[1,5-a]pyrid-5-yl)ethanol, 2-(3-aminopyrazolo[1,5-a]pyrid-7-yl)ethanol, (3-aminopyrazolo[1,5-a]pyrid-2-yl)methanol, 3,6-diaminopyrazolo[1,5-a]pyridine, 3,4-diaminopyrazolo[1,5-a]pyridine, pyrazolo[1,5-a]pyridine-3,7-diamine, 7-morpholin-4-ylpyrazolo[1,5-a]pyrid-3-ylamine, pyrazolo[1,5-a]pyridine-3,5-diamine, 5-morpholin-4-ylpyrazolo[1,5-a]pyrid-3-ylamine, 2-[(3-aminopyrazolo[1,5-a]pyrid-5-yl)(2-hydroxyethyl)amino]ethanol, 2-[(3-aminopyrazolo[1,5-a]pyrid-7-yl)(2-hydroxyethyl)amino]ethanol, 3-aminopyrazolo[1,5-a]pyridin-5-ol, 3-aminopyrazolo[1,5-a]pyridin-4-ol, 3-aminopyrazolo[1,5-a]pyridin-6-ol, 3-aminopyrazolo[1,5-a]pyridin-7-ol, 2- $\square$ -hydroxyethoxy-3-amino-pyrazolo[1,5-a]pyridine; 2-(4-diméthylpyperazinium-1-yl)-3-amino-pyrazolo[1,5-a]pyridine; and the addition salts thereof.

**[00106]** More particularly, oxidation bases can be selected from 3-aminopyrazolo[1,5-a]pyridines and preferably substituted on carbon atom 2 by:

- (a) one (di)(C<sub>1</sub>-C<sub>6</sub>)(alkyl)amino group wherein said alkyl group can be substituted by at least one hydroxy, amino, imidazolium group;
- (b) one heterocycloalkyl group containing from 5 to 7 members chain, and from 1 to 3

heteroatoms, potentially cationic, potentially substituted by one or more (C<sub>1</sub>-C<sub>6</sub>)alkyl, such as di(C<sub>1</sub>-C<sub>4</sub>)alkylpipérazinium; or

(c) one (C<sub>1</sub>-C<sub>6</sub>)alkoxy potentially substituted by one or more hydroxy groups such as  $\alpha$ -hydroxyalkoxy, and the addition salts thereof.

**[00107]** Among the pyrimidine derivatives that may be mentioned are the compounds described, for example, in the patents DE 2359399; JP 88-169571; JP 05-63124; EP 0770375 or patent application WO 96/15765, such as 2,4,5,6-tetraaminopyrimidine, 4-hydroxy-2,5,6-triaminopyrimidine, 2-hydroxy-4,5,6-triaminopyrimidine, 2,4-dihydroxy-5,6-diaminopyrimidine, 2,5,6-triaminopyrimidine and their addition salts and their tautomeric forms, when a tautomeric equilibrium exists.

**[00108]** Among the pyrazole derivatives that may be mentioned are the compounds described in the patents DE 3843892, DE 4133957 and patent applications WO 94/08969, WO 94/08970, FR-A-2 733 749 and DE 195 43 988, such as 4,5-diamino-1-methylpyrazole, 4,5-diamino-1-( $\beta$ -hydroxyethyl)pyrazole, 3,4-diaminopyrazole, 4,5-diamino-1-(4'-chlorobenzyl)pyrazole, 4,5-diamino-1,3-dimethylpyrazole, 4,5-diamino-3-methyl-1-phenylpyrazole, 4,5-diamino-1-methyl-3-phenylpyrazole, 4-amino-1,3-dimethyl-5-hydrazinopyrazole, 1-benzyl-4,5-diamino-3-methylpyrazole, 4,5-diamino-3-*tert*-butyl-1-methylpyrazole, 4,5-diamino-1-*tert*-butyl-3-methylpyrazole, 4,5-diamino-1-( $\beta$ -hydroxyethyl)-3-methylpyrazole, 4,5-diamino-1-ethyl-3-methylpyrazole, 4,5-diamino-1-ethyl-3-(4'-methoxyphenyl)pyrazole, 4,5-diamino-1-ethyl-3-hydroxymethylpyrazole, 4,5-diamino-3-hydroxymethyl-1-methylpyrazole, 4,5-diamino-3-hydroxymethyl-1-isopropylpyrazole, 4,5-diamino-3-methyl-1-isopropylpyrazole, 4-amino-5-(2'-aminoethyl)amino-1,3-dimethylpyrazole, 3,4,5-triaminopyrazole, 1-methyl-3,4,5-triaminopyrazole, 3,5-diamino-1-methyl-4-methylaminopyrazole, 3,5-diamino-4-( $\beta$ -hydroxyethyl)amino-1-methylpyrazole, and the addition salts thereof. 4,5-Diamino-1-( $\beta$ -methoxyethyl)pyrazole may also be used.

**[00109]** A 4,5-diaminopyrazole will preferably be used, and even more preferentially 4,5-diamino-1-( $\beta$ -hydroxyethyl)pyrazole and/or a salt thereof.

**[00110]** Pyrazole derivatives that may also be mentioned include diamino-N,N-dihydropyrazolopyrazolones and especially those described in patent application FR-A-2 886 136, such as the following compounds and the addition salts thereof: 2,3-diamino-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one, 2-amino-3-ethylamino-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one, 2-amino-3-isopropylamino-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one, 2-amino-3-(pyrrolidin-1-yl)-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-

one, 4,5-diamino-1,2-dimethyl-1,2-dihydropyrazol-3-one, 4,5-diamino-1,2-diethyl-1,2-dihydropyrazol-3-one, 4,5-diamino-1,2-di-(2-hydroxyethyl)-1,2-dihydropyrazol-3-one, 2-amino-3-(2-hydroxyethyl)amino-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one, 2-amino-3-dimethylamino-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one, 2,3-diamino-5,6,7,8-tetrahydro-1H,6H-pyridazino[1,2-a]pyrazol-1-one, 4-amino-1,2-diethyl-5-(pyrrolidin-1-yl)-1,2-dihydropyrazol-3-one, 4-amino-5-(3-dimethylaminopyrrolidin-1-yl)-1,2-diethyl-1,2-dihydropyrazol-3-one, 2,3-diamino-6-hydroxy-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one.

**[00111]** 2,3-Diamino-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one and/or a salt thereof will preferably be used.

**[00112]** 4,5-Diamino-1-( $\beta$ -hydroxyethyl)pyrazole and/or 2,3-diamino-6,7-dihydro-1H,5H-pyrazolo[1,2-a]pyrazol-1-one and/or a salt thereof will preferentially be used as heterocyclic bases.

**[00113]** Compositions may optionally further comprise one or more couplers advantageously chosen from those conventionally used in the dyeing or coloring of keratinous substrates.

**[00114]** Among these couplers, mention may be made especially of meta-phenylenediamines, meta-aminophenols, meta-diphenols, naphthalene-based couplers and heterocyclic couplers, and also the addition salts thereof.

**[00115]** Mention may be made, for example, of 2-methyl-5-aminophenol, 5-N-( $\beta$ -hydroxyethyl)amino-2-methylphenol, 3-aminophenol, 5-amino-6-chloro-o-cresol (3-amino-2-chloro-6-methylphenol), 1,3-dihydroxybenzene, 1,3-dihydroxy-2-methylbenzene, 4-chloro-1,3-dihydroxybenzene, 2,4-diamino-1-( $\beta$ -hydroxyethyloxy)benzene, 2-amino-4-( $\beta$ -hydroxyethylamino)-1-methoxybenzene, 1,3-diaminobenzene, 1,3-bis(2,4-diaminophenoxy)propane, 3-ureidoaniline, 3-ureido-1-dimethylaminobenzene, sesamol, 1- $\beta$ -hydroxyethylamino-3,4-methylenedioxybenzene,  $\alpha$ -naphthol, 2-methyl-1-naphthol, 6-hydroxyindole, 4-hydroxyindole, 4-hydroxy-N-methylindole, 2-amino-3-hydroxypyridine, 6-hydroxybenzomorpholine, 3,5-diamino-2,6-dimethoxypyridine, 1-N-( $\beta$ -hydroxyethyl)amino-3,4-methylenedioxybenzene, 2,6-bis( $\beta$ -hydroxyethylamino)toluene, 6-hydroxyindoline, 2,6-dihydroxy-4-methylpyridine, 1-H-3-methylpyrazol-5-one, 1-phenyl-3-methylpyrazol-5-one, 2,6-dimethylpyrazolo[1,5-b]-1,2,4-triazole, 2,6-dimethyl[3,2-c]-1,2,4-triazole and 6-methylpyrazolo[1,5-a]benzimidazole, the addition salts thereof with an acid, and mixtures thereof.

**[00116]** In general, the addition salts of the oxidation bases and couplers that may be

used are chosen from the addition salts with an acid such as the hydrochlorides, hydrobromides, sulfates, citrates, succinates, tartrates, lactates, tosylates, benzenesulfonates, phosphates and acetates.

**[00117]** The oxidation base(s) may be present in an amount ranging from about 0.001% to 10% by weight, such as from about 0.005% to 5% by weight, relative to the total weight of the composition comprising the system in which it is present.

**[00118]** The coupler(s), if they are present, may be present in an amount ranging from about 0.001% to 10% by weight, such as from about 0.005% to 5% by weight, relative to the total weight of the system or composition comprising the system in which it is present.

**[00119]** Compositions according to embodiments of the disclosure may optionally comprise one or more synthetic or natural direct dyes, for example chosen from anionic and nonionic species, preferably cationic or nonionic species, either as sole dyes or in addition to the oxidation dye(s).

**[00120]** Examples of suitable direct dyes that may be mentioned include azo direct dyes; (poly)methine dyes such as cyanins, hemicyanins and styryls; carbonyl dyes; azine dyes; nitro(hetero)aryl dyes; tri(hetero)arylmethane dyes; porphyrin dyes; phthalocyanin dyes, and natural direct dyes, alone or as mixtures.

**[00121]** Preferably direct dyes are cationic direct dyes. Mention may be made of the hydrazono cationic dyes of formulas **(Va)** and **(V'a)**, the azo cationic dyes **(VIa)** and **(VI'a)** and the diazo cationic dyes **(VIIa)** below:

<b>Het<sup>+</sup>-C(R<sup>a</sup>)=N-N(R<sup>b</sup>)-Ar, An<sup>-</sup></b>	<b>(Va)</b>
<b>Het<sup>+</sup>-N(R<sup>a</sup>)-N=C(R<sup>b</sup>)-Ar, An<sup>-</sup></b>	<b>(V'a)</b>
<b>Het<sup>+</sup>-N=N-Ar, An<sup>-</sup></b>	<b>(VIa)</b>
<b>Ar<sup>+</sup>-N=N-Ar'', An<sup>-</sup></b>	<b>(VI'a) and</b>
<b>Het<sup>+</sup>-N=N-Ar'-N=N-Ar, An<sup>-</sup></b>	<b>(VIIa)</b>

in which formulas **(Va)**, **(V'a)**, **(VIa)**, **(VI'a)** and **(VIIa)**:

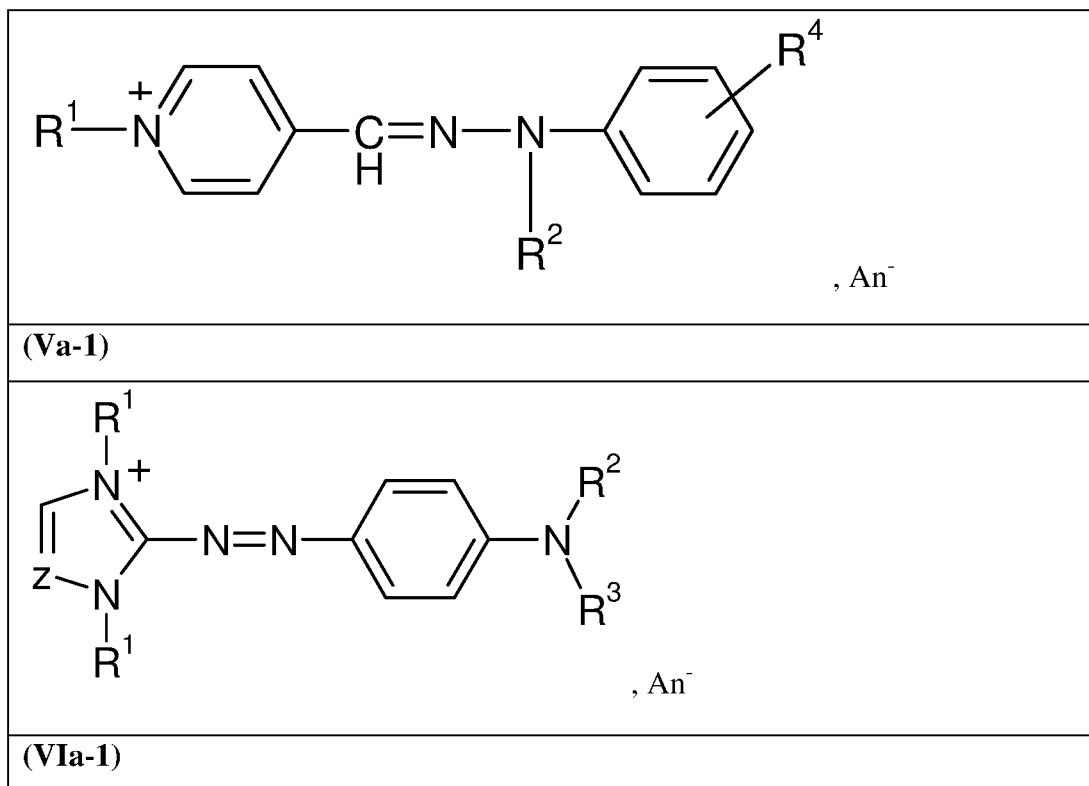
- **Het<sup>+</sup>** represents a cationic heteroaryl moiety, preferably bearing an endocyclic cationic charge, such as imidazolium, indolium or pyridinium, optionally substituted preferentially with one or more (C<sub>1</sub>-C<sub>8</sub>) alkyl groups such as methyl;



- **Ar<sup>+</sup>** representing an aryl moiety, such as phenyl or naphthyl, bearing an exocyclic cationic charge, preferentially ammonium, particularly tri(C<sub>1</sub>-C<sub>8</sub>)alkylammonium such as trimethylammonium;
- **Ar** represents an aryl group, especially phenyl, which is optionally substituted, preferentially with one or more electron-donating groups such as i) optionally substituted (C<sub>1</sub>-C<sub>8</sub>)alkyl, ii) optionally substituted (C<sub>1</sub>-C<sub>8</sub>)alkoxy, iii) (di)(C<sub>1</sub>-C<sub>8</sub>)(alkyl)amino optionally substituted on the alkyl group(s) with a hydroxyl group, iv) aryl(C<sub>1</sub>-C<sub>8</sub>)alkylamino, v) optionally substituted *N*-(C<sub>1</sub>-C<sub>8</sub>)alkyl-*N*-aryl(C<sub>1</sub>-C<sub>8</sub>)alkylamino or alternatively **Ar** represents a julolidine group;
- **Ar'** is an optionally substituted divalent (hetero)arylene group such as phenylene, particularly para-phenylene, or naphthalene, which are optionally substituted, preferentially with one or more groups (C<sub>1</sub>-C<sub>8</sub>)alkyl, hydroxyl or (C<sub>1</sub>-C<sub>8</sub>)alkoxy;
- **Ar''** is an optionally substituted (hetero)aryl group such as phenyl or pyrazolyl, which are optionally substituted, preferentially with one or more groups (C<sub>1</sub>-C<sub>8</sub>)alkyl, hydroxyl, (di)(C<sub>1</sub>-C<sub>8</sub>)(alkyl)amino, (C<sub>1</sub>-C<sub>8</sub>)alkoxy or phenyl;
- **R<sup>a</sup>** and **R<sup>b</sup>**, which may be identical or different, represent a hydrogen atom or a group (C<sub>1</sub>-C<sub>8</sub>)alkyl, which is optionally substituted, preferentially with a hydroxyl group; or alternatively the substituent **R<sup>a</sup>** with a substituent of **Het<sup>+</sup>** and/or **R<sup>b</sup>** with a substituent of **Ar** and/or **R<sup>a</sup>** with **R<sup>b</sup>** form, together with the atoms that bear them, a (hetero)cycloalkyl; particularly, **R<sup>a</sup>** and **R<sup>b</sup>** represent a hydrogen atom or a group (C<sub>1</sub>-C<sub>4</sub>)alkyl, which is optionally substituted with a hydroxyl group;
- **An<sup>-</sup>** represents an anionic counter-ion such as mesylate or halide.

In particular, mention may be made of the azo and hydrazono cationic dyes bearing an endocyclic cationic charge of formulae (**Va**), (**V'a**) and (**VIa**) as defined previously. More particularly mention may be made of those of formulae (**Va**), (**V'a**) and (**VIa**) derived from the dyes described in patent applications WO 95/15144, WO 95/01772 and EP-714954.

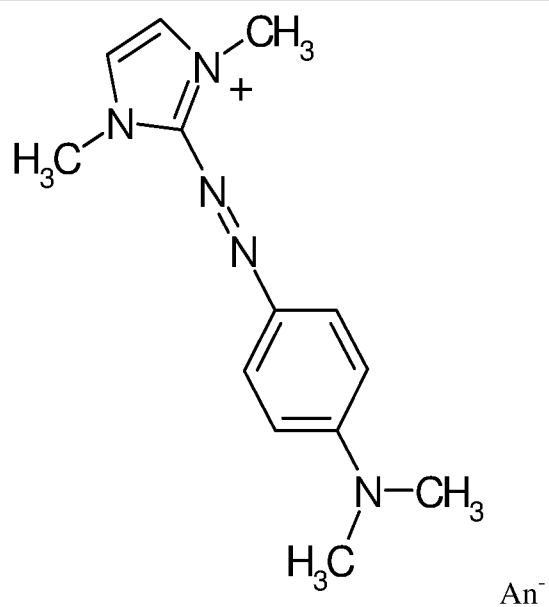
**[00122]** In various embodiments, the cationic part is derived from the following derivatives:



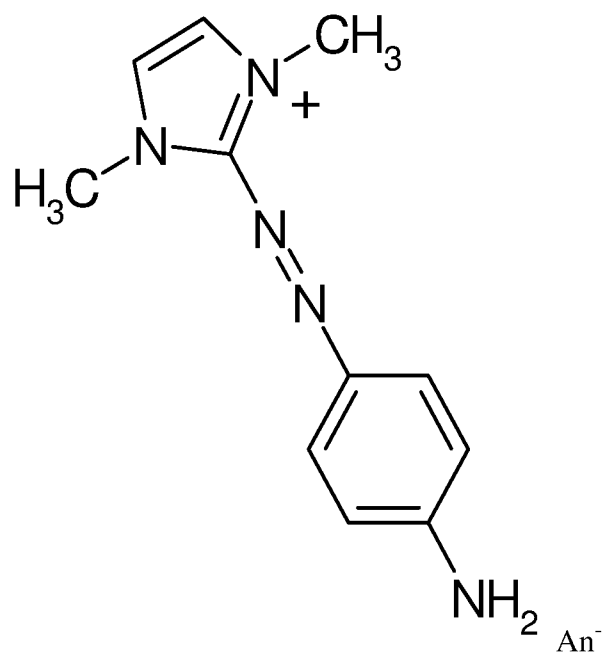
wherein in formulae **(Va-1)** and **(VIa-1)**:

- **R<sup>1</sup>** representing a (C<sub>1</sub>-C<sub>4</sub>) alkyl group such as methyl;
- **R<sup>2</sup>** and **R<sup>3</sup>**, which are identical or different, represent a hydrogen atom or a (C<sub>1</sub>-C<sub>4</sub>)alkyl group, such as methyl; and
- **R<sup>4</sup>** represents a hydrogen atom or an electron-donating group such as optionally substituted (C<sub>1</sub>-C<sub>8</sub>)alkyl, optionally substituted (C<sub>1</sub>-C<sub>8</sub>)alkoxy, or (di)(C<sub>1</sub>-C<sub>8</sub>)(alkyl)amino optionally substituted on the alkyl group(s) with a hydroxyl group; particularly, **R<sup>4</sup>** is a hydrogen atom,
- **Z** represents a CH group or a nitrogen atom, preferentially CH;
- **An<sup>-</sup>** represents an anionic counter-ion such as mesylate or halide.

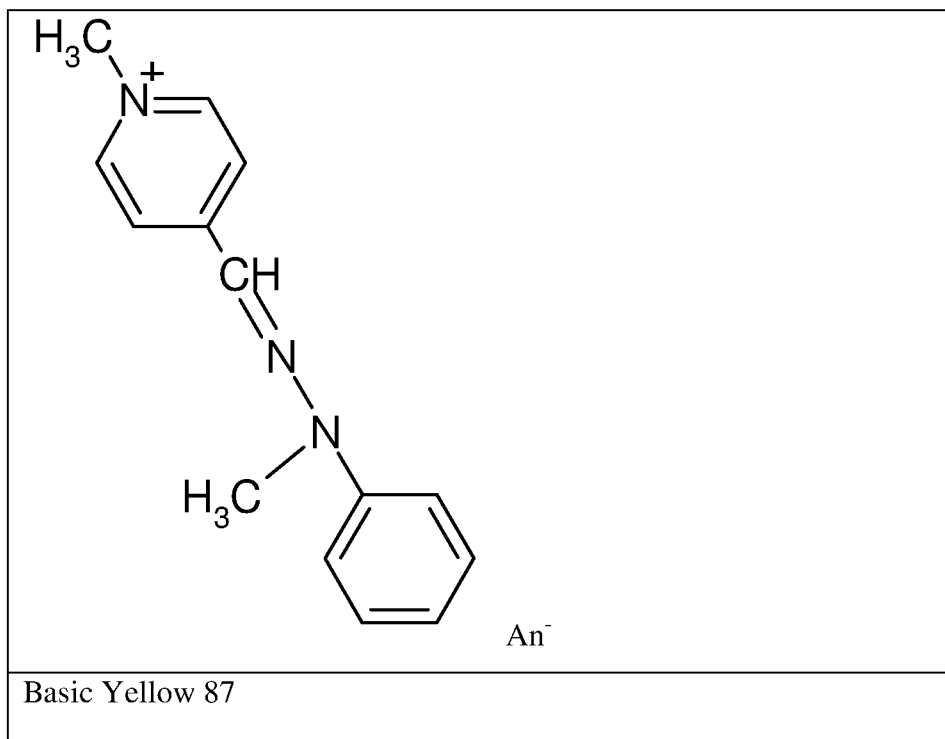
**[00123]** The dye of formulae **(Va-1)** and **(VIa-1)** can be chosen from Basic Red 51, Basic Yellow 87 and Basic Orange 31 or derivatives thereof:



Basic Red 51



Basic Orange 31



**[00124]** Among the natural direct dyes, mention may be made of lawsone, juglone, alizarin, purpurin, carminic acid, kermesic acid, purpurogallin, protocatechaldehyde, indigo, isatin, curcumin, spinulosin, apigenidin and orceins. Extracts or decoctions containing these natural dyes and in particular henna-based poultices or extracts may also be used.

When they are present, the one or more direct dyes more particularly represent from about 0.001% to 10% by weight, such as from about 0.005% to 5% by weight, of the total weight of the system or composition comprising the system in which it is present.

**[00125]** The color-altering composition may also comprise a cosmetically acceptable carrier. The cosmetically acceptable carrier may, for example, be present in the color-altering composition in an amount ranging from about 1% to about 40% by weight, such as from about 5% to about 35% by weight, or about 10% to about 30% by weight of the color-altering composition.

**[00126]** Auxiliary ingredients may be added to the color-altering composition. Exemplary auxiliary ingredients useful in the color-altering composition according to various embodiments of the disclosure include, but are not limited to, rheology-modifying agents, bleach activators and co-bleach activators, direct dyes, chelants, fatty substances, ceramides, alkoxyaminosilicones, silanes, and lift-enhancing agents, such as nitrogen-containing compounds and metal catalyst compounds.

**[00127]** The color-altering composition may also contain acid and alkali pH adjusters, which are well known in the art in the cosmetic treatment of keratin fibers, such as hair. Such pH adjusters include, but are not limited to, sodium metasilicate, silicate compounds, citric acid, ascorbic acid, and carbonate compounds.

**[00128]** The pH adjusters may, in various embodiments, be present in the color-altering composition in an amount effective to provide the color-altering composition with a pH of not greater than 7, such as a pH ranging from about 1 to about 7, from about 2 to about 6, or from about 3 to about 5. By way of example, the amount of pH adjuster may be present, in various embodiments, in an amount of at least about 0.01%, such as at least about 0.1%, at least about 0.2%, or at least about 0.5%.

**[00129]** The color-altering composition may, in at least certain embodiments, be in a ready-to-use form.

**[00130]** The color-altering composition may, in various embodiments, be applied onto the hair within about 24 hours, such as less than 24 hours or less than 12 hours, after the treatment composition. In at least certain exemplary embodiments, the color-altering composition may be applied to the hair within a few hours or a few minutes after the treatment composition. For example, the color-altering composition may be applied within about 1 to about 6 hours after the treatment composition, or may be applied up to about 60 minutes, such as up to about 30 minutes, up to about 20 minutes, up to about 10 minutes, up to about 5 minutes, up to about 2 minutes, or up to about 1 minute after the treatment composition.

**[00131]** The color-altering composition may be left on the hair for a period of time sufficient to achieve the desired alteration in hair tone. For example, the color-altering composition may be left on the hair for up to one hour, such as from about 3 minutes to about 45 minutes, from about 5 minutes to about 30 minutes, or from about 10 minutes to about 20 minutes. In further embodiments, the color-altering composition may be left on the hair for a period up to about 30 minutes, such as, for example, from about 1 to about 30 minutes, about 1 to about 10 minutes, or about 1 to about 5 minutes. One skilled in the art will, by considering various factors such as the starting and desired tones of the hair, be able to determine an appropriate amount of time to leave the color-altering composition on the hair in order to achieve the desired alternation in hair tone. By way of non-limiting example, various embodiments according to the disclosure may provide for an increase of 1 to 4 in the tone height of the hair.

**[00132]** If desired, the color-altering composition may, optionally, be shampooed and/or rinsed off the hair.

### **SHAPE-ALTERING COMPOSITION**

**[00133]** In further embodiments, a composition for shaping or altering the shape of the hair may be applied to the hair before, after, or simultaneously with the treatment composition. Compositions for altering the shape of the hair comprise hair shaping agents and may be any composition for altering the shape of the hair, for example compositions comprising one or more agents for straightening, relaxing, and/or shaping the hair.

**[00134]** By way of example, hair shaping agents may optionally be chosen from inorganic hydroxides or organic hydroxides, for example sodium hydroxide, potassium hydroxide, lithium hydroxide, calcium hydroxide, or guanidine hydroxide, or may be chosen from organic amines and other non-hydroxide compounds. In various embodiments, the hair relaxing agents may be chosen from thiol compounds such as cysteine, cysteamine, N-substituted cysteamines, alkyl substituted mercaptoacetamides, dimercaptodipic acid, thioglycerol, thiolactic acid, thioglycolic acid or its salts, (e.g., a thioglycolate), monothioglycolic acid esters such as diol esters of thioglycolic acid, glyceryl monothioglycolate, thiocholine or its salts, amino thiols, and thiols attached to low molecular weight polymers, sulfites such as sodium hyposulfite, and bisulfites such as ammonium or sodium bisulfite.

**[00135]** The compositions for altering the shape of the hair may optionally comprise at least one surfactant, for example amphoteric/ zwitterionic surfactants, nonionic surfactants, anionic surfactants, and cationic surfactants. By way of non-limiting example, the at least one surfactant may be present in an amount ranging from about 0.1% to about 5% by weight, such as from about 0.5% to about 3% by weight, based on the total weight of the shape-altering composition.

**[00136]** Exemplary amphoteric surfactants include, for example, lauryl betaine, lauroamphoglycinate, lauroamphopropylsulfonate, lauroamphopropionate, lauroamphocarboxyglycinate, lauryl sultane, myristamidopropyl betaine, myristyl betaine, myristoamphoglycinate, myristyl propionate, stearoamphoglycinate, stearoamphopropionate, stearoamphopropylsulfonate, stearyl betaine, cocamidoethyl betaine, cocamidopropyl betaine, cocamidopropyl hydroxysultane, cocamidopropyl dimethylamine propionate, cocoamphoglycinate, cocoamphocarboxypropionate, cocoamphocarboxyglycinate, coco-betaine, cocoamphopropionate, and cocoamphopropylsulfonate, and combinations thereof.

**[00137]** Exemplary nonionic surfactants include fatty acid esters and alkoxyated, particularly ethoxyated, fatty acid esters of polyhydric alcohols such as glycerols and sorbitol, for example, polyoxyethylene monolaurate, polyoxyethylene monooleate, polyoxyethylene monostearate, sorbitan monolaurate, sorbitan trioleate, generally with a degree of ethoxylation of from about 20 to about 85; mono- and di-alkanolamides, such as the N-acyl derivatives of mono- and di-ethanol amines, and polyethoxyated monoalkanolamides such as PEG-15 cocamide; amine oxides, such as cocamidopropyl dimethylamine oxides, coco bis-2-hydroxyethyl amine oxides and lauryl dimethylamine oxide; ethoxyated alkanolamides; ethoxyated oils and fats such as ethoxyated lanolins; and ethoxyated alkylphenols, such as nonoxynol, and combinations thereof.

**[00138]** Exemplary anionic surfactants include, alkylethercarboxylic acids, such as laureth-11 carboxylic acid, the alkali metal, ammonium, or amine salts of alkyl sulfates, alkyl ether sulfates, linear alpha-olefin sulfonates, dialkyl sulfosuccinates, alkylamidossulfosuccinates, and alkyl taurates each having from about C.sub.12 to C.sub.18 alkyl or alkenyl groups, and combinations thereof. Particular examples include the salts of lauryl sulfates and lauryl ether sulfates, the latter having an average level of ethoxylation of 1-3.

**[00139]** Exemplary cationic surfactants include quaternium-16, quaternium-26, quaternium-27, quaternium-30, quaternium-33, quaternium-43, quaternium-52, quaternium-53, quaternium-56, quaternium-60, quaternium-61, quaternium-62, quaternium-70, quaternium-71, quaternium-72, quaternium-75, quaternium-76 hydrolyzed collagen, quaternium-77, quaternium-78, quaternium-79 hydrolyzed collagen, quaternium-79 hydrolyzed keratin, quaternium-79 hydrolyzed milk protein, quaternium-79 hydrolyzed silk, quaternium-79 hydrolyzed soy protein, and quaternium-79 hydrolyzed wheat protein, quaternium-80, quaternium-81, quaternium-82, quaternium-83, quaternium-84, and combinations thereof.

**[00140]** Hair shaping compositions may further contain at least one additional ingredient typically found in such compositions. Examples of such ingredients include, but are not limited to, acid and alkali pH adjusting agents, chelating agents, swelling agents, solvents, structuring agents such as waxes and polymers, hydrophobic (lipophilic) and hydrophilic thickeners or gelling agents, skin conditioning agents, sunscreen agents (e.g., octocrylene, octinoxate, avobenzone), preservatives (e.g., sodium citrate, phenoxyethanol, parabens and mixtures thereof), cosmetic active agents and dermatological active agents such as, for example, hydrolyzed peptides, farnesol, bisabolol, phytantriol, aesthetic agents such as

essential oils, fragrances, skin sensates, opacifiers, aromatic compounds (e.g., clove oil, menthol, camphor, eucalyptus oil, and eugenol), foam enhancers, and botanical extracts.

**[00141]** The hair shaping composition may also comprise a cosmetically acceptable carrier. The cosmetically acceptable carrier may, for example, be present in the shape-altering composition in an amount ranging from about 1% to about 40% by weight, such as from about 5% to about 35% by weight, or about 10% to about 30% by weight of the shape-altering composition.

**[00142]** In various embodiments, the hair shaping composition comprises or is used in conjunction with at least one neutralizer, for example an oxidizing agent. Exemplary useful oxidizing agents include peroxides, bromates, and perborates, e.g., hydrogen peroxide, potassium bromate, sodium bromate and sodium perborate.

**[00143]** The hair shaping composition may, in various embodiments, be applied onto the hair within about 24 hours, such as less than 24 hours or less than 12 hours, after the treatment composition. In at least certain exemplary embodiments, the shape-altering composition may be applied to the hair within a few hours or a few minutes after the treatment composition. For example, the shape-altering composition may be applied within about 1 to about 6 hours after the treatment composition, or may be applied up to about 60 minutes, such as up to about 30 minutes, up to about 20 minutes, up to about 10 minutes, up to about 5 minutes, up to about 2 minutes, or up to about 1 minute after the treatment composition.

**[00144]** The shape-altering composition may be left on the hair for a period of time sufficient to achieve the desired alteration in hair shape. For example, the shape-altering composition may be left on the hair for up to one hour, such as from about 3 minutes to about 45 minutes, from about 5 minutes to about 30 minutes, or from about 10 minutes to about 20 minutes. In further embodiments, the shape-altering composition may be left on the hair for a period up to about 30 minutes, such as, for example, from about 1 to about 30 minutes, about 1 to about 10 minutes, or about 1 to about 5 minutes. One skilled in the art will, by considering various factors such as starting hair shape and desired hair shape, be able to determine an appropriate amount of time to leave the shape-altering composition on the hair in order to achieve the desired alternation in hair shape.

**[00145]** If desired, the shape-altering composition may, optionally, be shampooed and/or rinsed off the hair.



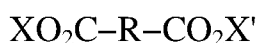
**CONDITIONING COMPOSITION**

**[00146]** After the treatment composition and/or color-altering composition and/or shape-altering composition have been applied to the hair, and optionally shampooed and/or rinsed, the hair may be further treated with a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid. In various non-limiting exemplary embodiments, the 3-butoxypropylamine may be neutralized by the at least one carboxylic acid. As used herein, the 3-butoxypropylamine being neutralized with the at least one carboxylic acid means that the 3-butoxypropylamine is completely neutralized, is substantially completely neutralized, or is partially neutralized. The term “neutralized” means that the 3-butoxypropylamine is protonated by  $H^+$  (proton) coming from, but not limited to, acidic sources such as the carboxylic acid(s).

**[00147]** In various embodiments, the 3-butoxypropylamine may be present in the conditioning composition in an amount up to about 10%, such as up to about 9%, up to about 8%, up to about 7%, up to about 6%, up to about 5%, up to about 4%, up to about 3%, up to about 2%, up to about 1%, up to about 0.90%, up to about 0.80%, up to about 0.70%, up to about 0.60%, or up to about 0.50% by weight, based on the weight of the conditioning composition. By way of non-limiting example only, the 3-butoxypropylamine may be present in an amount ranging from about 0.1% to about 5%, such as about 0.75% to about 4%, or about 1% to about 3% by weight, based on the weight of the conditioning composition. In one embodiment, the 3-butoxypropylamine may be present in an amount ranging from about 2% to about 3% by weight, based on the weight of the conditioning composition.

**[00148]** The at least one carboxylic acid useful for the conditioning composition may be any organic compound containing at least one acid functional group and at least one carbon atom, such as the carboxylic acids described above for the treatment composition. Exemplary and non-limiting carboxylic acids that may be used include organic compounds that include, for example, one, two, three, or more carboxylic acid functional groups ( $COOH$ ) and at least one carbon atom.

**[00149]** In certain exemplary, and non-limiting embodiments, the at least one carboxylic acid may be chosen from saturated or unsaturated, substituted or unsubstituted dicarboxylic acids, salts thereof, and mixtures thereof. By way of non-limiting example, the at least one carboxylic acid may be chosen from dicarboxylic acids of the following formula:



wherein:

-R is a cyclic or acyclic, saturated or unsaturated, linear or branched, C<sub>1</sub>-C<sub>100</sub> hydrocarbon moiety comprising from 0 to 30 double and/or triple bonds and/or from 0 to 10 rings, and optionally interrupted by 1 to 30 heteroatoms chosen from O, N and S, and optionally substituted with 1 to 30 substituents chosen from a hydrogen atom, a hydroxyl (-OH) moiety, an amino (-NH<sub>2</sub>) moiety, a (C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a poly(C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a hydroxy(C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a polyhydroxy(C<sub>1</sub>-C<sub>30</sub>)alkylamino moiety, a C<sub>6</sub>-C<sub>30</sub> aryl moiety, and in some embodiments -R may be omitted; and

-X and X', independently denote a hydrogen atom, an ammonium ion, a ion of an alkali metal such as Li, Na, K, or an alkaline earth metal such as Be, Mg, Ca or an ion derived from an organic amine such as an alkylamine.

**[00150]** It is understood that the expression cyclic hydrocarbon moiety for the purposes of the present application is understood to mean a hydrocarbon moiety consisting of one or more rings or comprising one or more rings which are pendent or in the principle chain, it being possible for the rings to be saturated or unsaturated and to be substituted with one or more C<sub>1</sub>-C<sub>30</sub> alkyl or alkenyl or hydroxyl or amino moieties.

**[00151]** By way of non-limiting example only, carboxylic acids useful in the conditioning composition may include oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, maleic acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, as well as combinations thereof. In at least one embodiment, the conditioning composition comprises at least one carboxylic acid other than maleic acid.

**[00152]** It should be noted, however, that the carboxylic acid chosen for the conditioning composition may be the same as or different from the at least one carboxylic acid chosen for the treatment composition. In at least one embodiment, the conditioning composition comprises maleic acid and optionally at least one additional carboxylic acid. In further embodiments, the conditioning composition comprises at least one carboxylic acid other than maleic acid. In further embodiments, the conditioning composition is free or substantially free of maleic acid.

**[00153]** The at least one carboxylic acid may be present in the conditioning composition in an amount up to about 10%, such as up to about 9%, up to about 8%, up to

about 7%, up to about 6%, up to about 5%, up to about 4%, up to about 3%, up to about 2%, up to about 1%, or up to about 0.50% by weight, based on the weight of the conditioning composition. By way of non-limiting example only, the carboxylic acid may be present in an amount ranging from about 0.50% to about 10%, such as about 1% to about 8%, about 2% to about 7%, about 3% to about 6%, or about 4% to about 5% by weight, based on the weight of the conditioning composition. In one exemplary embodiment, the carboxylic acid may be present in an amount of about 6% to about 8% by weight, based on the weight of the conditioning composition. It should be understood that when more than one carboxylic acid is present, the total amount of carboxylic acids may be present in these amounts.

**[00154]** The conditioning composition may, in various embodiments, be in the form of an emulsion, and may optionally comprise additional components, for example surfactants, solvents, and/or conditioning agents, as well as other additives.

**[00155]** By way of non-limiting example, the solvent may be chosen from cosmetically acceptable solvents chosen from water, at least one cosmetically acceptable organic solvent, and mixtures thereof.

**[00156]** The organic solvents may be volatile or non-volatile compounds. As examples of organic solvents, non-limiting mentions can be made of monoalcohols and polyols such as ethanol, isopropyl alcohol, propyl alcohol, benzyl alcohol, and phenylethanol, or glycols or glycol ethers such as, for example, monomethyl, monoethyl and monobutyl ethers of ethylene glycol, propylene glycol or ethers thereof such as, for example, monomethyl ether of propylene glycol, butylene glycol, hexylene glycol, dipropylene glycol as well as alkyl ethers of diethylene glycol, for example monoethyl ether or monobutyl ether of diethylene glycol. Other suitable examples of organic solvents are ethylene glycol, propylene glycol, butylene glycol, hexylene glycol, propane diol, and glycerine.

**[00157]** The cosmetically acceptable solvent may comprise an amount ranging up to about 98%, such as up to about 95%, up to about 90%, up to about 85%, up to about 80%, up to about 75%, up to about 70%, up to about 65%, up to about 60%, up to about 55%, or up to about 50%, by weight, based on the weight of the conditioning composition. For example, the cosmetically acceptable solvent may range from about 80% to about 98% by weight, such as from about 85% to about 95% by weight by weight, based on the weight of the conditioning composition.

**[00158]** Conditioning agents that may be included in the conditioning composition include, but are not limited to, cationic, anionic, non-ionic, and amphoteric conditioning agents. For example, cationic conditioning agents may be chosen from polyquaterium-10

(also called quaternized polyhydroxyethyl cellulose), cetrimonium chloride (also called cetyl trimethyl ammonium chloride, CTAC), behentrimonium chloride (also known as docosyl trimethyl ammonium chloride), behentrimonium methosulfate, steartrimonium chloride, stearalkonium chloride, dicetyldimonium chloride, hydroxypropyltrimonium chloride, cocotrimonium methosulfate, olealkonium chloride, steartrimonium chloride, babassuamidopropalkonium chloride, brassicamidopropyl dimethylamine, Quaternium-91, Salcare/PQ-37, Quaternium-22, Quaternium-87, Polyquaternium-4, Polyquaternium-6, Polyquaternium-11, Polyquaternium-44, Polyquaternium-67, amodimethicone, lauryl betaine, Polyacrylate-1 Crosspolymer, steardimonium hydroxypropyl hydrolyzed wheat protein, behenamidopropyl PG-dimonium chloride, lauryldimonium hydroxypropyl hydrolyzed soy protein, aminopropyl dimethicone, Quaterium-8, and dilinoleamidopropyl dimethylamine dimethicone PEG-7 phosphate.

**[00159]** Amphoteric conditioning agents may be chosen from polyquaternium-22, polyquaternium-39, polyquaternium-47, polyquaternium-53, arginine, asparagines, aspartic acid, glycine, glutamic acid, lysine, methionine, phenylalanine, serine, threonine, tyrosine, tryptophan, valine, gelatin, Quaternium-27, oleamidopropyl betaine, disodium cocoamphodiacetate, disodium cocoamphodipropionate, disodium lauroamphodiacetate, sodium cocoamphopropionate, sodium cocoamphoacetate, meadowfoam delta lactone, cocoamidopropyl betaine, cocoamidopropyl hydroxysultaine, lauramidopropyl betaine, carnitine, hydroxyproline, acetyl hydroxy proline, isoleucine, lauroyl lysine, lauroyl sarcosine, polylysine, proline, rice amino acids, silk amino acids, and wheat amino acids.

**[00160]** Additional auxiliary components that may be present in the conditioning composition include but are not limited to coloring agents, emulsifiers, thickening agents and rheology modifying agents, cationic polymers, humectants and moisturizing agents, chelating agents such as glycine, emulsifying agents other than those that fall under the above-described fatty substances, fillers, structuring agents, propellants, anionic surfactants, cationic surfactants, amphoteric surfactants, shine agents, conditioning agents, shine agents, and strengthening agents.

**[00161]** If present, the at least one auxiliary component may be present in an amount up to about 25%, such as up to about 20%, up to about 15%, or up to about 10% by weight, such as from about 0.1% to about 10% by weight, from about 0.5% to about 5%, or about 1 to about 3% by weight, based on the total weight of the conditioning composition.

**[00162]** The pH of the conditioning composition can range from about 1 to about 7, such as from about 2 to about 5, or about 3 to about 4.

**[00163]** According to various embodiments, the conditioning composition may include 3-BPA and a combination of carboxylic acids. By way of non-limiting example, the conditioning composition may include 3-BPA and a combination of two carboxylic acids, such as malonic acid and citric acid, malonic acid and oxalic acid, malonic acid and maleic acid, malonic acid and malic acid, citric acid and oxalic acid, citric acid and maleic acid, citric acid and malic acid, oxalic acid and maleic acid, oxalic acid and malic acid, maleic acid and malic acid, and so on. In other embodiments, the conditioning composition may include 3-BPA and combinations of three or more carboxylic acids.

**[00164]** In some embodiments, the conditioning composition may include 3-BPA and one or more saturated carboxylic acids, and may be free or substantially free of unsaturated carboxylic acids. In other embodiments, the conditioning composition may include 3-BPA and one or more unsaturated carboxylic acids and be free or substantially free of saturated carboxylic acids. In still other embodiments, the conditioning composition may include 3-BPA and both saturated (e.g. oxalic acid, malonic acid, glutaric acid, succinic acid, adipic acid, glycolic acid, citric acid, tartaric acid, malic acid, sebacic acid, glyoxylic acid monohydrate) and unsaturated (maleic acid, fumaric acid, benzoic acid, citraconic acid) carboxylic acids

**[00165]** In certain exemplary embodiments, the conditioning composition may include from about 0.1 wt% to about 5 wt% 3-BPA, such as from about 0.5 wt% to about 3 wt%, or from about 0.5 wt% to about 2 wt% 3-BPA, such as about 0.5 wt% to about 1 wt%, based on the weight of the conditioning composition. In certain exemplary embodiments, the conditioning composition may include from about 0.1 wt% to about 5 wt% carboxylic acids, such as from about 0.5 wt% to about 4 wt%, or from about 0.75 wt% to about 3 wt%, such as about 1 wt% to about 2 wt% carboxylic acids, based on the weight of the conditioning composition.

**[00166]** By way of non-limiting example only, the conditioning composition may include from about 0.5 wt% to about 2 wt% 3-BPA and from about 0.75 wt% to about 3 wt% of one or more carboxylic acids, such as from about 0.5 wt% to about 1 wt% 3-BPA and from about 1 wt% to about 2 wt% of one or more carboxylic acids, based on the weight of the conditioning composition. By way of non-limiting example, the conditioning composition may include from about 5 wt% to about 6 wt% 3-BPA and from about 1 wt% to about 2 wt% maleic and/or malonic acid, based on the weight of the conditioning composition.

**[00167]** Without intending to limit the disclosure, it may, in various embodiments, be advantageous to choose certain amounts of the 3-BPA, at least one carboxylic acid, solvent,

and/or optionally any additional component in the conditioning composition, or ratios of the components in relation to one another, in order to provide or enhance synergistic results from the combinations thereof.

**[00168]** The treatment and/or conditioning compositions according to the disclosure can be in various forms, such as in the form of liquids, creams, liquid-gels, liquid-creams, gels, lotions, or pastes.

## **METHODS**

**[00169]** As described herein, the treatment and/or conditioning compositions, and/or the systems comprising the treatment and conditioning compositions, may be used to treat the hair, for example before, during, and/or after a process to chemically alter the color or shape of hair, before, during, and/or after application of a composition that is not a color- or shape-altering composition, and/or as a stand-alone treatment for damaged hair. For example, a color- or shape-altering composition may comprise the treatment composition, or the treatment composition may comprise a color- or shape-altering composition or agent or composition. It should be understood that when “a color-altering composition comprises the treatment composition,” “a shape-altering composition comprises the treatment composition,” “the treatment composition comprises a color-altering composition,” “the treatment composition comprises a shape-altering composition,” or the like, the two compositions or their components are mixed together, but without any limitation, for example on which composition is added to which or the order of mixing.

**[00170]** In further embodiments, the treatment composition may be applied to the hair first, and optionally shampooed and/or rinsed, after which a color- or shape-altering composition, or composition that is not a color- or shape-altering composition, is applied to the hair. In various embodiments, the conditioning composition may be applied to the hair after the treatment composition and/or color- or shape-altering composition are applied to the hair, and optionally shampooed and/or rinsed.

**[00171]** As used herein, treatment compositions may be applied to the hair “before” chemical treatment of the hair, such as before shaping, coloring, or lightening the hair, with or without shampooing or rinsing in between, such as less than one minute before, up to about 5 minutes before, up to about 10 minutes before, up to about 20 minutes before, up to about 30 minutes before, up to about 1 hour before, up to about 2 hours before, up to about 6

hours before, up to about 12 hours before, up to about 24 hours before, up to about 48 hours before, up to about 72 hours before, or up to about 1 week before, for example.

**[00172]** As used herein, treatment compositions may be applied to the hair “after” chemical treatment of the hair, such as after shaping, coloring, or lightening the hair, with or without shampooing or rinsing in between, such as less than one minute after, up to about 5 minutes after, up to about 10 minutes after, up to about 20 minutes after, up to about 30 minutes after, up to about 1 hour after, up to about 2 hours after, up to about 6 hours after, up to about 12 hours after, up to about 24 hours after, up to about 48 hours after, up to about 72 hours after, or up to about 1 week after, for example.

**[00173]** As used herein, treatment compositions may be applied to the hair “during” chemical treatment of the hair, for example simultaneously with or at approximately the same time as chemical treatment such as shaping, coloring, or lightening the hair, for example by combining or mixing the treatment composition with the chemical treatment composition prior to application of the mixture to the hair. By way of example, the treatment compositions may be mixed with a color- or shape-altering composition at an amount ranging up to about 30% by weight, relative to the weight of the color-altering composition, such as up to about 25%, up to about 20%, or up to about 15% by weight, relative to the weight of the color-altering composition. For example, the treatment composition may be mixed with a color- or shape-altering composition at an amount ranging from about 1% to about 20%, about 2% to about 15%, about 3% to about 13%, or about 4% to about 10% by weight, relative to the weight of the color-altering composition. In yet further exemplary embodiments, the treatment composition and color- or shape-altering composition may be applied to the hair at substantially the same time, but from separate applicators without mixing prior to application to the hair, either with or without shampooing or rinsing in between.

**[00174]** By way of non-limiting example, a method for treating or altering the shape or color of the hair may comprise applying the treatment composition onto the hair as a pre-relaxing, pre-permanent waving, pre-straightening, pre-coloring, pre-glazing, or pre-lightening composition, which may optionally be left on the hair or washed out before application of the color- or shape-altering composition. In a further exemplary embodiment, a method may comprise adding the treatment composition into a color- or shape-altering composition, optionally just prior to use, and applying the mixture to the hair. In yet a further exemplary embodiment, a method may comprise adding a shape- or color-altering agent, for example an oxidizing agent or a dye, into the treatment composition, optionally just prior to

use, and applying the treatment composition to the hair. In yet a further exemplary embodiment, a method may comprise mixing a shaping agent or colorant or bleach composition and developer just prior to use, wherein the treatment composition may be pre-formulated into the shaping or coloring or bleach composition, or developer composition. In yet a further exemplary embodiment, a method may comprise applying the conditioning composition onto the hair as a post-treatment composition after the hair has been treated and after optionally rinsing or washing the hair.

**[00175]** The term “mix” and all variations of this term as used herein refers to contacting or combining or reconstituting or dissolving or dispersing or blending or shaking the treatment composition with the shape- or color-altering composition. It can also mean introducing the treatment composition to the shape- or color-altering composition. It may also mean placing the treatment composition in the same vessel or container as the color-altering composition.

**[00176]** As a further example, a treatment composition according to the disclosure may be applied to the hair following the reducing step of a hair treatment process, e.g. a relaxer, straightener, or permanent wave. After an optional leave-in (processing) time, e.g. about 5-20 minutes, such as about 10-15 minutes, the hair may optionally be blotted or rinsed, and then the conditioning composition applied to the hair, and optionally shampooed and/or rinsed. Without wishing to be bound by theory, it is believed that the reducing step of the process swells the hair cuticle, rendering it able to accept active component(s) from the treatment composition, and the conditioning composition then de-swells the hair cuticle, sealing in the active component(s).

**[00177]** In yet further exemplary embodiments, the treatment composition, the conditioning composition, or systems comprising the treatment composition and the conditioning composition, may be applied to the hair not in conjunction with a color-altering or shape-altering composition or process. Such treatment compositions, conditioning compositions, and/or systems comprising the treatment composition and the conditioning composition may be useful to provide cosmetic advantages such as shine, conditioning, fiber strength, and/or a healthy appearance to the hair, separate and apart from avoiding or minimizing damage to the hair caused by chemical processes such as coloring, bleaching, shaping, relaxing, etc., the hair.

**[00178]** By way of non-limiting example only, a treatment composition according to the disclosure may be mixed with a composition that does not contain an agent for altering the color or shape of the hair, may be applied directly to the hair, for example simultaneously



with a composition that does not contain an agent for altering the color or shape of the hair, or may be mixed with water and applied to the hair, and optionally the hair may be shampooed and/or rinsed, after which a conditioning composition according to the disclosure may be applied to the hair, and optionally shampooed and/or rinsed.

**[00179]** In a further exemplary embodiment, methods relate to processes for treating the hair where only a portion of hair is subjected to a chemical process such as a color- or shape-altering process. By way of example, when hair is highlighted, only certain portions of hair on the head of a consumer are treated with a bleaching or highlighting agent. However, different portions of hair may be treated (e.g. highlighted) during subsequent color- or shape-altering processes, thus causing more damage to certain portions of the hair over time. Thus, it may be desirable in such embodiments to treat the entire head of hair with a treatment composition according to the disclosure. As such, in various embodiments, a treatment composition according to the disclosure may be applied to certain portions of the hair in conjunction with a bleaching or highlighting or hair dyeing or shaping process (e.g. mixed with a bleaching or highlighting or hair dyeing or shaping composition), while a treatment composition according to the disclosure may be applied to other portions of the hair that are not subjected to the chemical process, for example in a composition not containing an agent coloring or shaping the hair. Although some overlap of treated portions of the hair may occur, various embodiments contemplate that the treated hair will consist essentially of different portions of the hair.

**[00180]** Accordingly, methods of altering the color or shape of the hair are within the scope of the disclosure wherein a first treatment composition comprising 3-butoxypropylamine; at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; at least one solvent; and at least one agent for altering the color or shape of the hair is applied to certain portions of hair; and a second treatment composition comprising 3-butoxypropylamine; at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and at least one solvent; wherein the second treatment composition does not contain an agent for altering the shape or color of the hair, is applied to different portions of hair. The second treatment composition may, for example, be applied directly to the hair, or may be mixed with water or a composition such as a clear

glaze. Optionally, a conditioning composition according to the disclosure may also be applied to the hair, e.g. a portion of the hair or the entire treated hair. In various embodiments, it may be possible for the at least one carboxylic acid in the first and second treatment compositions and/or the conditioning composition to be the same or different, and the at least one carboxylic acid for each should be understood to be chosen independently.

**[00181]** In various exemplary methods or processes, the treatment composition or mixture comprising the treatment composition may be applied to the hair, and after an optional leave-in (processing) time on the hair fibers, for example, ranging from about 1 to about 60 minutes, such as from about 5 to about 50 minutes, or such as from about 5 to about 30 minutes, or such as from about 10 to about 20 minutes, or such as of about 20 minutes, the hair fibers may be rinsed, optionally washed with shampoo and rinsed again, the conditioning composition applied to the hair fibers, and after a second optional resting time, optionally washed with a hair conditioning composition, rinsed again, then dried. The conditioning composition may be left on the hair for a resting or leave-in period ranging up to about 60 minutes, such as from about 1 to about 30 minutes, or from about 5 to about 15 minutes. The shampoo and hair conditioning composition can be any conventional hair shampoo and/or conditioner products.

**[00182]** The temperature during the methods of treating the hair may be, for example, between room temperature and 80°C, such as between room temperature and 60°C, or between room temperature and 40°C.

**[00183]** It has been discovered that the application of the treatment composition, the conditioning composition, or a system comprising the treatment composition and conditioning composition onto the fibers, in conjunction with a process for altering the color and/or shape of the hair, results in satisfactory lifting or lightening of the color of the fibers, or alteration of the shape of the hair fibers, while providing strengthening and/or protection to the hair fiber, so as to minimize damage to the hair fiber in at least some embodiments. Additionally, when the embodiments of the composition comprise a colorant compound selected from oxidative dye precursors, direct dyes, pigments or their mixtures, the fibers are also colored satisfactorily with respect to degree of color deposit and desirable shade formation coloring, while providing strengthening and/or protection to the hair fiber, so as to avoid or minimize damage to the hair fiber in at least some embodiments.

**[00184]** It is to be understood that any degree of protection and/or strengthening and/or minimizing of damage may be imparted to the hair fiber, without limitation. In addition, it is

intended that embodiments that do not impart fiber strength and/or protection and/or minimization of damage to the hair fiber are also within the scope of the disclosure.

### **KITS**

**[00185]** Further embodiments of the disclosure relate to kits for treatment and/or altering the color and/or shape of the hair. One exemplary embodiment of a kit for treating and/or altering the color of hair comprises:

- A. a first compartment containing a treatment composition comprising:
  - i. 3-butoxypropylamine ;
  - ii. at least one carboxylic acid; and
  - iii. optionally at least one solvent; and
- B. a second compartment containing a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid; and
- C. optionally, one or more additional compartments comprising at least one hair coloring agent or composition:

**[00186]** Further exemplary embodiments of a kit for treating and/or altering the color of hair comprise:

- A. a first compartment containing a treatment composition comprising:
  - i. 3-butoxypropylamine ;
  - ii. at least one carboxylic acid; and
  - iii. optionally at least one solvent; and
- B. a second compartment containing a conditioning composition comprising 3-BPA and at least one carboxylic acid; and
- C. optionally, one or more additional compartments comprising at least one hair coloring agent or composition,

wherein the first and/or second compartments comprise at least one acid chosen from maleic acid, citric acid, malonic acid, or mixtures thereof.

**[00187]** A further exemplary embodiment of a kit for treating and/or altering the shape of hair comprises:

- A. a first compartment containing a treatment composition comprising:
  - i. 3-butoxypropylamine ;
  - ii. at least one carboxylic acid; and
  - iii. optionally at least one solvent; and

- B. a second compartment containing a conditioning composition comprising 3-butoxypropylamine and at least one carboxylic acid; and
- C. optionally, one or more additional compartments comprising at least one agent or composition for shaping the hair.

**[00188]** Further exemplary embodiments of a kit for treating and/or altering the shape of hair comprise:

- A. a first compartment containing a treatment composition comprising:
  - i. 3-butoxypropylamine ;
  - ii. at least one carboxylic acid; and
  - iii. optionally at least one solvent; and
- B. a second compartment containing a conditioning composition comprising 3-BPA and at least one carboxylic acid; and
- C. optionally, one or more additional compartments comprising at least one agent or composition for shaping the hair,

wherein the first and/or second and/or compartments comprise at least one acid chosen from maleic acid, citric acid, malonic acid, or mixtures thereof.

**[00189]** According to various embodiments, the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition of any of the aforementioned kits may independently be chosen from maleic acid, oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof. In some embodiments, the at least one carboxylic acid in the treatment composition and the conditioning composition in the first and second compartments of the kit are the same. In other embodiments, the at least one carboxylic acid in the treatment composition and the conditioning composition in the first and second compartments of the kit are different.

**[00190]** In some embodiments, the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition of the first and second compartments of the kit are independently chosen from malonic acid, maleic acid, citric acid, and combinations thereof. In further embodiments, the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from citric acid, malonic acid, oxalic acid, malic acid, glutaric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, sebacic acid, glyoxylic acid monohydrate, and combinations thereof. In yet further embodiments, the at least one carboxylic acid is chosen

from maleic acid, citraconic acid, fumaric acid, benzoic acid, and combinations thereof. In still further embodiments, the carboxylic acid present in the treatment composition, the carboxylic acid present in the conditioning composition in the first and second compartments of the kit, or both, may be independently chosen from combinations of two carboxylic acids, chosen from: malonic acid and citric acid; malonic acid and oxalic acid; malonic acid and maleic acid; malonic acid and malic acid; citric acid and oxalic acid; citric acid and maleic acid; citric acid and malic acid; oxalic acid and maleic acid; oxalic acid and malic acid; and maleic acid and malic acid. In still further embodiments, the carboxylic acid present in the treatment composition, the carboxylic acid present in the conditioning composition in the first and second compartments of the kit, or both, may be independently chosen from combinations of three or more carboxylic acids.

**[00191]** In various exemplary and non-limiting embodiment, the at least one carboxylic acid present in the treatment composition in any of the aforementioned compositions, systems, methods, and kits is chosen from malonic acid. In further exemplary and non-limiting embodiments, the at least one carboxylic acid present in the treatment composition in any of the aforementioned compositions, systems, methods, and kits is chosen from maleic acid.

**[00192]** It to be understood that, as used herein the terms “the,” “a,” or “an,” mean “at least one,” and should not be limited to “only one” unless explicitly indicated to the contrary. Thus, for example, reference to “a portion” includes examples having two or more such portions unless the context clearly indicates otherwise.

**[00193]** Unless otherwise expressly stated, it is in no way intended that any method set forth herein be construed as requiring that its steps be performed in a specific order. Accordingly, where a method claim does not actually recite an order to be followed by its steps or it is not otherwise specifically stated in the claims or descriptions that the steps are to be limited to a specific order, it is no way intended that any particular order be inferred.

**[00194]** While various features, elements or steps of particular embodiments may be disclosed using the transitional phrase “comprising,” it is to be understood that alternative embodiments, including those that may be described using the transitional phrases “consisting” or “consisting essentially of,” are implied. Thus, for example, implied alternative embodiments to a method that comprises A+B+C include embodiments where a method consists of A+B+C and embodiments where a method consists essentially of A+B+C. As described, the phrase “at least one of A, B, and C” is intended to include “at least one A or at least one B or at least one C,” and is also intended to include “at least one A and at least

one B and at least one C.”

**[00195]** All ranges and amounts given herein are intended to include subranges and amounts using any disclosed point as an end point. Thus, a range of “1% to 10%, such as 2% to 8%, such as 3% to 5%,” is intended to encompass ranges of “1% to 8%,” “1% to 5%,” “2% to 10%,” and so on. All numbers, amounts, ranges, etc., are intended to be modified by the term “about,” whether or not so expressly stated. Similarly, a range given of “about 1% to 10%” is intended to have the term “about” modifying both the 1% and the 10% endpoints.

**[00196]** Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the disclosure are approximations, unless otherwise indicated the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contains certain errors necessarily resulting from the standard deviation found in their respective testing measurements. The example that follows serves to illustrate embodiments of the present disclosure without, however, being limiting in nature.

**[00197]** It will be apparent to those skilled in the art that various modifications and variations can be made in the delivery system, composition and methods of the invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided that they come within the scope of the appended claims and their equivalents.

## EXAMPLES

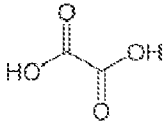
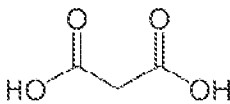
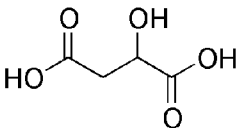

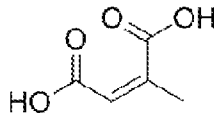
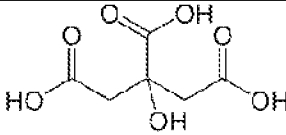
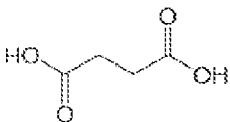
**[00198]** The ingredient amounts in the composition/formulations described below are expressed in % by weight, based on the total weight of the composition, unless otherwise indicated.

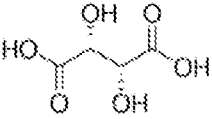
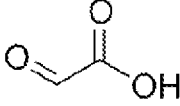
### **Examples 1-1 to 1-13**

#### **Compositions**

**[00199]** The following are exemplary treatment compositions comprising 3-butoxypropylamine, at least one carboxylic acid, and at least one solvent. In Table 1, the amounts given are % by weight of the treatment composition, and the pH of each of the treatment compositions is approximately 3.0.

Table 1:

Formulation	Carboxylic Acid	Formula	Treatment Composition
1-1	Oxalic		(11.28%) Oxalic acid (18.68%) Ethanol (18.26%) 3-butoxypropylamine (51.78%) DI water
1-2	Oxalic		(8.27%) Oxalic acid (18.66%) Ethanol (14.09%) 3-butoxypropylamine (58.98%) DI water
1-3	Malonic		(9.19%) Malonic Acid (82.41%) DI Water (8.40%) 3-butoxypropylamine
1-4	Malic		(12.38%) Malic Acid (81.45%) DI Water (6.17%) 3-butoxypropylamine
1-5	Glutaric		(87.92%) DI water (12.072%) Glutaric acid (0.0070%) 3-butoxypropylamine
1-6	Citriconic		(12.59%) Citraconic Acid (76.75%) DI Water (10.66%) 3-butoxypropylamine
1-7	Citric		(17.87%) Citric Acid (73.54%) DI Water (8.59%) 3-butoxypropylamine
1-8	Succinic		(93.92%) DI water (5.50%) Succinic acid (0.58%) 3-butoxypropylamine
1-9	Succinic + malic	above	(84.52%) DI water (5.08%) Succinic acid (5.06%) Malic Acid (6.02%) 3butoxypropylamine

1-10	Tartaric		(76.44%) DI water (13.89%) Tartaric acid (9.67%) 3-butoxypropylamine
1-12	Glyoxylic acid monohydrate		(8.44%) Glyoxylic Acid (28.4%) Ethanol (60.17%) DI water (2.99%) 3-butoxypropylamine

**[00200]** The exemplary treatment compositions of Table 1 may be applied to the hair before or after a color-altering composition, or may be mixed with a color-altering composition for simultaneous application with the color-altering composition.

**[00201]** The following conditioning compositions were prepared by mixing formulations 2b-1 through 2b-8 of Table 2b into the composition of Table 2a. In Tables 2a-2b, the amounts given are % by weight of the conditioning composition.

**Table 2a:**

Component	Amount
WATER	QS
PROPYLENE GLYCOL	3
CETEARYL ALCOHOL	1
CETEARYL ALCOHOL and BEHENTRIMONIUM METHOSULFATE	4
GLYCERIN	0.5
STEARAMIDOPROPYL DIMETHYLAMINE	0.5
HYDROXYETHYLCELLULOSE	0.5
QUATERNIUM-91 and CETEARYL ALCOHOL and CETRIMONIUM METHOSULFATE	0.5



CETRIMONIUM CHLORIDE	0.55
POLYQUATERNIUM-37 (and) MINERAL OIL (and) PPG-1 TRIDECETH-6	0.4
BENZOIC ACID	0.2
PHENOXYETHANOL	0.5
3-BUTOXYPROPYLAMINE + CARBOXYLIC ACID	Table 2b

**Table 2b:**

<b>Formulation</b>	<b>3-BUTOXYPROPYLAMINE + CARBOXYLIC ACID (pH = 3.5)</b>
2b-1	1.474% Oxalic Acid + 2.15% 3-butoxypropylamine
2b-2	1.7% Malonic Acid + 2.15% 3-butoxypropylamine
2b-3	1.933% Succinic Acid + 2.15% 3-butoxypropylamine
2b-4	2.163% Glutaric Acid + 2.15% 3-butoxypropylamine
2b-5	2.195% Malic Acid + 2.15% 3-butoxypropylamine
2b-6	2.457% Tartaric Acid + 2.15% 3-butoxypropylamine
2b-7	1.9% Fumaric Acid + 2.15% 3-butoxypropylamine
2b-8	2.13% Citraconic Acid + 2.15% 3-butoxypropylamine

**[00202]** The conditioning compositions prepared by mixing the formulations of Tables 2a and 2b may be applied to the hair after the hair is treated with a treatment composition and/or color-altering composition and/or shape-altering composition, as described herein.

**Methods**

**[00203]** The following are examples of methods or processes for treating the hair in vitro and in vivo.

**Bleaching Process in vitro**

**[00204]** A conventional bleach (30g) and developer (30-60g) may be mixed with a treatment composition (8g), applied to the hair, and left on the hair for 50 minutes or more to achieve an equal lift to the bleach standard treated for 50 min. The processing may be done at room temperature. The hair may be rinsed, after which a conditioning composition (0.4g/g of hair) may be applied to the hair and left for a period of 10 minutes at room temperature, and then rinsed. The hair may be shampooed and rinsed, and conditioner applied and rinsed.

**Example—Bleaching Process in vivo**

**[00205]** A conventional bleach (30g) and developer (30-60g) may be mixed with a treatment composition (8g), applied to the hair, and left on the hair for up to 50 minutes or until desired lift is achieved. The processing may be done at room temperature. The hair may be rinsed, after which a conditioning composition (15g-30g) applied to the hair and left for a resting of 10 minutes at room temperature, and rinsed. The hair may be shampooed and rinsed, and conditioner applied and rinsed.

**Example—Glazing Process in vivo**

**[00206]** A conventional glaze (Shades EQ, 60g) and processing solution (60g) may be mixed with a treatment composition (4g), applied to the hair, and left on the hair for about 20 minutes at room temperature. The hair may be rinsed, after which a conditioning composition (15-30g) applied to the hair and left for a resting of 10 minutes at room temperature, and rinsed. The hair may be shampooed and rinsed, and conditioner applied and rinsed.

**Example—Bleaching and Glazing Process in vivo**

**[00207]** A conventional bleach (30g) and developer (30-60g) may be mixed with a treatment composition (8g), applied to the hair, and left on the hair for about 50 minutes or until desired lift is achieved, at room temperature. The hair may be rinsed and shampooed. A conventional glaze (Shades EQ, 60g) and processing solution (60g) may be mixed with a

treatment composition (4g), applied to the hair, and left on the hair for about 20 minutes at room temperature. The hair may be rinsed, after which a conditioning composition (15-30g) applied to the hair and left for a resting of 10 minutes at room temperature, and then rinsed. The hair may be shampooed and rinsed, and conditioner applied and rinsed.

### **In Vitro Treatment Composition Examples**

**[00208]** The following exemplary treatment compositions as set forth in Table 3 were prepared and adjusted to pH 3, except where otherwise indicated. In Table 3, the amounts given are % by weight of the treatment composition, with the balance of each composition being water.

**[00209]** The hair treatment selected was a conventional standard bleach including a bleach composition (30g) and a developer (30-60g) was mixed with each treatment composition (8g). The mixture was applied to replicate hair samples, under the recited conditions. The hair samples were then washed and evaluated. All examples were conducted to achieve the same level of lift (lightening level). The time was adjusted accordingly. This allows a direct comparison of the level of damage caused to the hair.

**[00210]** The evaluations of the hair samples treated with the exemplary compositions were compared with the evaluations of the hair samples treated with a standard bleach composition, with acid or amine alone, or with acid or amine pH adjusted to about pH 3.

## **Results**

### **Cysteic Acid Data**

**[00211]** Since the amount of cysteic acid is an indication of the level of damaged hair, a lower measured concentration indicates that a particular composition provided a protection benefit to the hair fiber. Therefore, the measured concentration of cysteic acid is a marker with respect to the assessment of fiber integrity. An improvement of 10% (% relative change) is typically considered to be statistically significant, such that an increase in the fiber integrity.

**[00212]** A portion of hair samples (swatches) of hair were cut and weighted to approximately 20 mg, hydrolyzed under strong acidic conditions for 16 hours at 110°C. Once hydrolyzed, samples were pH adjusted to approximately 1.7 with a solution of lithium hydroxide and analyzed on a Hitachi amino acid analyzer, Model 8900. Amino acid standards obtained from Sigma Aldrich (Ref AAS18) were utilized to calibrate the instrument and to calculate the concentration of amino acids for each of the treatment conditions. The comparisons shown in Table 3 below show cysteic acid measurements of compositions of

Table 3, which were compared to samples treated with only a standard bleach (bleach and developer composition) and to compositions not containing 3-BPA and at least one carboxylic acid.

#### Miniature Tensile Tester Data

**[00213]** Hair samples bleached with standard bleach compositions containing treatment compositions containing 3-BPA were assessed for wet tensile strength using a fiber tensile testing instrument from Dia-Stron known as an MTT (Miniature Tensile Tester). For each sample, 50 fibers were run. From the test, Young's Modulus (elasticity, MPa) and Break Stress (force per unit area required to break the fiber, MPa) were determined. Results of the testing are shown below in Table 4.

#### Raw Data

**Table 3: Cysteic Acid Data**

<b>Exemplary Treatment Composition</b>	<b>% Amine /base</b>	<b>moles of Amine /base per 100g</b>	<b>% Acid</b>	<b>moles Acid per 100g</b>	<b>pH</b>	<b>Conditions</b>	<b>Cysteic Acid (gAA/100 gAA)</b>
Standard Bleach						30V 50min	6.4
3 Butoxypropyl Amine + water	11.80%	0.090	-	-	12.00	30V, 50min	5.9
Standard Bleach						30V 50min	6.7
Citric Acid + water	-	-	17.30%	0.090	1.36	30V, 75min	5.2
Malonic Acid + water	-	-	9.37%	0.090	1.28	30V, 65min	5.5
Malic Acid + water	-	-	12.07%	0.090	1.58	30V, 65min	5.4
Standard Bleach						30V, 50min	4.6
3 Butoxypropyl Amine + Malic	11.58%	0.088	24.07%	0.180	3.05	30V, 100min	3.7
Standard Bleach						30V, 50min	6.3
3 Butoxypropyl Amine + HCl	11.80%	0.090	3.82%	0.105	3.07	30V, 75min	6.4
Standard Bleach						30V,	6.6

Exemplary Treatment Composition	% Amine /base	moles of Amine /base per 100g	% Acid	moles Acid per 100g	pH	Conditions	Cysteic Acid (gAA/100 gAA)
						60min	
Malonic Acid + NaOH	2.63%	0.066	9.37%	0.090	2.99	30V, 55min	5.8
Citric Acid + NaOH	2.57%	0.064	17.30%	0.090	2.98	30V, 60min	5.1
Malic Acid + NaOH	1.53%	0.038	12.07%	0.090	2.98	30V, 60min	5.9
Standard Bleach						30V, 50min	6.2
Oxalic Acid + water	-	-	8.10%	0.090	0.61	30V, 65min	5.0
3 Butoxypropyl Amine + Citric Acid	11.60%	0.088	24.16%	0.126	3.04	30V, 90min	4.8
Standard Bleach						30V, 50min	6.5
3 Butoxypropyl Amine + Oxalic	8.64%	0.066	4.59%	0.051	3.05	30V, 70min	5.8
Standard Bleach						30V, 50 min	6.7
Maleic Acid + NaOH	1.03%	0.026	3.14%	0.027	3.15	30V, 50 min	6.5
Standard Bleach						30, 50 min	6.9
3 Butoxypropyl Amine + Malonic	11.80%	0.090	13.15%	0.126	3.04	30V, 80 min	5.6
Maleic Acid + water	-	-	10.40%	0.090	0.90	30V, 60min	5.7
Standard Bleach						30, 50 min	6.7
3 Butoxypropyl Amine + Maleic Acid	11.50%	0.088	10.70%	0.092	2.97	30V, 65min	5.1

**Table 4: MTT**

Composition Added to Standard Bleach	wt% Amine /base	moles of Amine /base per 100g	wt% Acid	moles Acid per 100g	pH	Conditions	Elastic Mod. (Mpa)	Break Stress (Mpa)
None: Standard Bleach						30V 50min	730 .29	94 .47
3 Butoxypropyl Amine + water	11.80%	0.090	-	-	12.00	30V, 50min	809.35	110.09
Malonic Acid + water	-	-	9.37%	0.090	1.28	30V, 65min	868.24	117.43
Maleic Acid + water	-	-	10.40%	0.090	0.90	30V, 60min	817.93	109.31
Malonic Acid + NaOH	2.63%	0.066	9.37%	0.090	2.99	30V, 55min	743.88	106.15
Maleic Acid + NaOH	1.03%	0.026	3.14%	0.027	3.15	30V, 50 min	741.48	105.22
3-BPA + Malic Acid	11.58%	0.088	24.07%	0.180	3.05	30V, 100min	995.41	121.73
3-BPA + Citric Acid	11.60%	0.088	24.16%	0.126	3.04	30V, 90min	823.55	110.58
3-BPA + Oxalic Acid	8.64%	0.066	4.59%	0.051	3.05	30V, 70min	823.55	110.58
3-BPA + Malonic Acid	11.80%	0.090	13.15%	0.126	3.04	30V, 80 min	961.27	115.18
3-BPA + Maleic Acid	11.50%	0.088	10.70%	0.092	2.97	30V, 65min	1031.61	118.26

**[00214]** Based on the MTT results in Table 4, it is evident that a mixture of bleach with the combination of 3-BPA and a carboxylic acid provides a large improvement in elastic modulus and break stress compared to bleach alone, as well as to the other examples in the comparison, for an equivalent lift (lightening level). The combination of 3-BPA and a carboxylic acid therefore provides improved resistance to breakage to hair treated with a mixture comprising the combination.

#### Strength and Tactile Substance

**[00215]** Hair samples treated with exemplary treatment compositions were tested for tactile substance relative to hair samples treated with 3-BPA alone, 3-BPA pH adjusted with hydrochloric acid to pH of about 3, carboxylic acid alone, and carboxylic acid pH adjusted with sodium hydroxide to pH of about 3.

**[00216]** The evaluation for strength (hair that is easy to detangle and comb, having an above average resistance to bend) and tactile substance (smooth surface feel, when pulled

maintains elasticity) was carried out visually and by feel by expert evaluators on wet hair samples, and each sample rated for each property. The results are set forth in Table 5 and FIGS. 1-5, where the increase (positive change) and decrease (negative change) are relative to the bleach standard, considered as baseline (0).

**Table 5: Sensory Data**

<b>3BPA + Citric Acid (FIG. 1)</b>					
<b>3BPA + Citric Acid</b>	3-BPA + nothing	3-BPA + HCl	3-BPA + Citric Acid	Citric Acid + Nothing	Citric Acid + NaOH
Strength	1	0.5	1.5	2.5	0.5
Tactile Substance	3	2	2	-2.5	-2
<b>3BPA + Malonic Acid (FIG. 2)</b>					
<b>3-BPA + Malonic Acid</b>	3-BPA + nothing	3-BPA + HCl	3-BPA + Malonic	Malonic Acid + Nothing	Malonic Acid + NaOH
Strength	1	0.5	1	0	-1
Tactile Substance	3	2	1.5	-1	0
<b>3BPA + Malic Acid (FIG. 3)</b>					
<b>3-BPA + Malic Acid</b>	3-BPA + nothing	3-BPA + HCL	3-BPA+ Malic	Malic Acid + Nothing	Malic Acid + NaOH
Strength	1	0.5	0.5	0.5	0.5
Tactile Substance	3	2	1.5	-1.5	-2
<b>3BPA + Maleic Acid (FIG. 4)</b>					
<b>3-BPA + Maleic Acid</b>	3-BPA + nothing	3-BPA + HCl	3-BPA + Maleic Acid	Maleic Acid + Nothing	Maleic Acid + NaOH
Strength	1	0.5	1.5	0.5	0
Tactile Substance	3	2	2	1	-1.5

<b>3BPA + Oxalic Acid (FIG. 5)</b>				
<b>3-BPA + Oxalic Acid</b>	3-BPA + nothing	3-BPA + HCl	3-BPA + Oxalic Acid	Oxalic Acid + Nothing
Strength	1	0.5	-0.5	-0.5
Tactile Substance	3	2	0.5	-1

**[00217]** As shown in Table 5 and FIGS. 1-5, the best combinations of tactile substance and strength resulted from treatment compositions including 3-BPA and at least one carboxylic acid.

#### Highlighted Comparisons

**[00218]** For Comparisons 1-2 below, the cysteic acid and MTT data are reproduced from the tables above, but not the sensory data. Note that the sensory conclusions are based on the data shown in the tables from the previous sensory raw data section.

#### Comparison 1: Malonic Acid + 3-BPA

**Table 6: 3-BPA and Malonic Acid Comparison**

<b>3BPA + Malonic Acid</b>	<b>Cysteic Acid Bleach Std (gAA/100gAA)</b>	<b>Cysteic Acid Sample (gAA/100gAA)</b>	<b>Cysteic Acid Absolute Difference</b>	<b>Cysteic Acid % Difference</b>	<b>MTT Elastic Modulus (MPa)</b>	<b>MTT Break Stress (MPa)</b>
Bleach Standard					730.29	105.17
3BPA + Water	6.4	5.9	0.5	8.13	809.35	110.09
3BPA + HCl	6.3	6.4	-0.1	-1.57	755.09	108.49
3BPA + Malonic	6.9	5.6	1.3	20.80	961.27	115.18
Malonic + Water	6.7	5.5	1.2	19.67	868.24	117.43
Malonic + NaOH	6.6	5.8	0.8	12.90	743.88	106.15

**[00219]** As shown in Table 6, the combination of 3-BPA and malonic acid reduced the level of cysteic acid compared with bleach alone and all the examples in the comparison. Based on the MTT results of Table 6, this combination of ingredients also showed a large



improvement in elastic modulus compared to bleach alone and all the examples in the comparison, and a large increase in break stress over bleach alone. The sensory data as described above showed that the invention had improvement in strength and tactile substance over bleach alone, as well as over all of the other examples.

Comparison 2: Maleic Acid + 3-BPA

**Table 7: 3-BPA and Maleic Acid Comparison**

<b>3BPA + Maleic Acid</b>	<b>Cysteic Acid Bleach Std (gAA/100gAA)</b>	<b>Cysteic Acid Sample (gAA/100gAA)</b>	<b>Cysteic Acid Absolute Difference</b>	<b>Cysteic Acid % Difference</b>	<b>MTT Elastic Modulus (MPa)</b>	<b>MTT Break Stress (MPa)</b>
Bleach Standard					730.29	105.17
3BPA + Water	6.4	5.9	0.5	8.13	809.35	110.09
3BPA + HCl	6.3	6.4	-0.1	-1.57	755.09	108.49
3BPA + Maleic	6.7	5.1	1.6	27.12	1031.61	118.26
Maleic + Water	6.9	5.7	1.2	19.05	817.93	109.31
Maleic + NaOH	6.7	6.5	0.2	3.03	741.48	105.22

**[00220]** As shown in Table 7, the combination of 3-BPA and maleic acid reduced the level of cysteic acid when compared to bleach alone and all the examples in the comparison. Based on MTT results, this combination of ingredients also showed a dramatic improvement in elastic modulus and break stress compared to bleach alone and all the examples in the comparison. The sensory data described above showed that the invention had improvement in strength and tactile substance over bleach alone, as well as over all of the other examples.

**WHAT IS CLAIMED IS:**

1. A hair treatment composition comprising:  
3-butoxypropylamine;  
at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and  
at least one solvent.
2. The hair treatment composition of claim 1, wherein the at least one carboxylic acid is chosen from citric acid, malonic acid, oxalic acid, malic acid, glutaric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, sebacic acid, glyoxylic acid monohydrate, and combinations thereof.
3. The hair treatment composition of claim 1, wherein the at least one carboxylic acid is chosen from maleic acid, citraconic acid, fumaric acid, benzoic acid, and combinations thereof.
4. The hair treatment composition of claim 1, wherein the at least one carboxylic acid is chosen from maleic acid, malonic acid, and combinations thereof.
5. The hair treatment composition of claim 1, wherein the 3-butoxypropylamine and at least one carboxylic acid are each present in an amount up to about 20% by weight, based on the weight of the hair treatment composition.
6. The hair treatment composition of claim 1, wherein the 3-butoxypropylamine and at least one carboxylic acid are each present in an amount ranging from about 1% to about 10% by weight, based on the weight of the hair treatment composition.
7. The hair treatment composition of claim 1, wherein the solvent is chosen from water, cosmetically acceptable organic solvents, and combinations thereof.

8. A hair conditioning composition comprising:
  - 3-butoxypropylamine;
  - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
  - at least one additive.
9. The hair conditioning composition of claim 8, wherein the at least one carboxylic acid is chosen from citric acid, malonic acid, oxalic acid, malic acid, glutaric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, sebacic acid, glyoxylic acid monohydrate, and combinations thereof.
10. The hair conditioning composition of claim 8, wherein the at least one carboxylic acid is chosen from maleic acid, citraconic acid, fumaric acid, benzoic acid, and combinations thereof.
11. The hair conditioning composition of claim 8, wherein the at least one carboxylic acid is chosen from maleic acid, malonic acid, and combinations thereof.
12. The hair conditioning composition of claim 8, wherein the 3-butoxypropylamine and at least one carboxylic acid are each present in an amount up to about 10% by weight, based on the weight of the hair conditioning composition.
13. The hair conditioning composition of claim 8, wherein the 3-butoxypropylamine and at least one carboxylic acid are each present in an amount ranging from about 1% to about 3% by weight, based on the weight of the hair conditioning composition.
14. The hair conditioning composition of claim 8, wherein the at least one additive is chosen from surfactants, solvents, and/or conditioning agents.
15. A hair treatment system comprising:
  - (a) a hair treatment composition comprising:
    - 3-butoxypropylamine;

at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and

at least one solvent; and

(b) a hair conditioning composition comprising:

3-butoxypropylamine;

at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and

at least one additive.

16. The hair treatment system of claim 15, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from citric acid, malonic acid, oxalic acid, malic acid, glutaric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, sebacic acid, glyoxylic acid monohydrate, and combinations thereof.

17. The hair treatment system of claim 15, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, citraconic acid, fumaric acid, benzoic acid, and combinations thereof.

18. The hair treatment system of claim 15, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, malonic acid, and combinations thereof.

19. The hair treatment system of claim 15, further comprising a composition or agent for coloring or shaping the hair.

20. The hair treatment system of claim 19, wherein the composition for coloring or shaping the hair comprises the hair treatment composition.

21. The hair treatment system of claim 19, wherein the agent for coloring the hair is chosen from bleaching agents, colorant compounds, or combinations thereof, and/or the agent for shaping the hair is chosen from agents for straightening, relaxing, or permanent waving the hair.
22. The hair treatment system of claim 21, wherein:  
the at least one bleaching agent is chosen from peroxides, persulfates, perborates, percarbonates, peracids, bromates, their salts, and mixtures thereof; and  
the at least one colorant compound is chosen from oxidation dyes, direct dyes, pigments, and mixtures thereof.
23. A composition for altering the color of the hair, said composition comprising:  
(a) a hair treatment composition comprising:  
3-butoxypropylamine;  
at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and  
at least one solvent; and  
(b) at least one bleaching agent, at least one colorant compound, or combinations thereof.
24. A method of treating the hair, said method comprising:  
(a) applying to the hair a hair treatment composition comprising:  
3-butoxypropylamine;  
at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, , sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and  
at least one solvent; and  
(b) optionally shampooing and/or rinsing the hair;  
(c) applying to the hair a hair conditioning composition comprising:

3-butoxypropylamine;  
at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and  
at least one additive; and  
(d) optionally shampooing and/or rinsing the hair.

25. The method according to claim 24, wherein the hair treatment composition further comprises a composition or agent for coloring or shaping the hair.

26. The method of claim 25, wherein the color-altering composition comprises at least one bleaching agent, at least one colorant compound, or combinations thereof.

27. The method of claim 26, wherein:  
the at least one bleaching agent is chosen from peroxides, persulfates, perborates, percarbonates, peracids, bromates, their salts, and mixtures thereof; and  
the at least one colorant compound is chosen from oxidation dyes, direct dyes, pigments, and mixtures thereof.

28. A method of altering the color of the hair, said method comprising:  
(a) applying to the hair a composition comprising:  
3-butoxypropylamine;  
at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof;  
at least one solvent; and  
at least one bleaching agent, at least one colorant compound, or combinations thereof;  
(b) optionally shampooing and/or rinsing the hair;  
(c) applying to the hair a hair conditioning composition comprising:  
3-butoxypropylamine;

at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and

at least one additive; and

(d) optionally shampooing and/or rinsing the hair.

29. A method of altering the color of the hair, said method comprising:

(a) applying to the hair a treatment composition comprising:

3-butoxypropylamine;

at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and

at least one solvent;

(b) optionally shampooing and/or rinsing the hair;

(c) applying to the hair a color-altering composition comprising at least one bleaching agent, at least one colorant compound, or combinations thereof, before, after, or simultaneously with the application of the hair treatment composition;

(d) optionally shampooing and/or rinsing the hair;

(e) applying to the hair a hair conditioning composition comprising:

3-butoxypropylamine;

at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and

at least one additive; and

(f) optionally shampooing and/or rinsing the hair.

30. The method according to claims 28 or 29, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, malonic acid, or combinations thereof.

31. A multi-compartment kit for altering the color of hair, said kit comprising:

- (a) a first compartment containing a hair treatment composition comprising:
  - 3-butoxypropylamine;
  - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
  - at least one solvent;
- (b) a second compartment containing a hair conditioning composition comprising:
  - 3-butoxypropylamine;
  - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
  - at least one additive; acid;
- (c) optionally, one or more additional compartments containing at least one coloring component.

32. The multi-compartment kit of claim 31, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from citric acid, malonic acid, oxalic acid, malic acid, glutaric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, sebacic acid, glyoxylic acid monohydrate, and combinations thereof.

33. The multi-compartment kit of claim 31, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, citraconic acid, fumaric acid, benzoic acid, and combinations thereof.

34. The multi-compartment kit of claim 31, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, malonic acid, and combinations thereof.

35. The multi-compartment kit of claim 31, wherein the at least one coloring component is chosen from at least one bleaching agent, at least one colorant compound, or



combinations thereof.

36. A composition for altering the shape of the hair, said composition comprising:
- (a) a hair treatment composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
    - at least one solvent; and
  - (b) at least one agent for straightening, relaxing, or permanent waving the hair.
37. A method of altering the shape of the hair, said method comprising:
- (a) applying to the hair a composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof;
    - at least one solvent; and
    - at least one agent for straightening, relaxing, or permanent waving the hair;
  - (b) optionally shampooing and/or rinsing the hair;
  - (c) applying to the hair a hair conditioning composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
    - at least one additive; and
  - (d) optionally shampooing and/or rinsing the hair.

38. A method of altering the shape of the hair, said method comprising:
- (a) applying to the hair a treatment composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
    - at least one solvent;
  - (b) optionally shampooing and/or rinsing the hair;
  - (c) applying to the hair a hair-shaping composition comprising at least one agent for straightening, relaxing, or permanent waving the hair, before, after, or simultaneously with the application of the hair treatment composition;
  - (d) optionally shampooing and/or rinsing the hair;
  - (e) applying to the hair a hair conditioning composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
    - at least one additive; and
  - (f) optionally shampooing and/or rinsing the hair.
39. The method according to claims 37 or 38, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, malonic acid, or combinations thereof.
40. A multi-compartment kit for altering the shape of hair, said kit comprising:
- (a) a first compartment containing a hair treatment composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
    - at least one solvent;

- (b) a second compartment containing a hair conditioning composition comprising:
  - 3-butoxypropylamine;
  - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
  - at least one additive; and
- (c) optionally, one or more additional compartments containing at least one agent for straightening, relaxing, or permanent waving the hair.

41. The multi-compartment kit of claim 40, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from citric acid, malonic acid, oxalic acid, malic acid, glutaric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, sebacic acid, glyoxylic acid monohydrate, and combinations thereof.

42. The multi-compartment kit of claim 40, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, citraconic acid, fumaric acid, benzoic acid, and combinations thereof.

43. The multi-compartment kit of claim 40, wherein the at least one carboxylic acid present in the hair treatment composition and/or the hair conditioning composition are independently chosen from maleic acid, malonic acid, and combinations thereof.

44. A method of treating the hair, said method comprising:

- (a) applying to the hair a hair treatment composition comprising:

- 3-butoxypropylamine;
  - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, , sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
  - at least one solvent.

45. A method according to claim 44, wherein the treatment composition further comprises at least one agent for altering the color of the hair.
46. A method according to claim 45, wherein the agent for altering the color of the hair is chosen from bleaching agents chosen from peroxides, persulfates, perborates, percarbonates, peracids, bromates, their salts, and mixtures thereof.
47. The method according to claim 45, wherein the agent for altering the color of the hair or a composition comprising the agent for altering the color of the hair is mixed with the treatment composition prior to application to the hair.
48. The method according to claim 47, wherein the mixing occurs less than one hour prior to application of the mixture to the hair.
49. A method of altering the color of the hair, said method comprising:
- (a) (1) applying to a portion of hair a treatment composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof;
    - at least one solvent; and
    - at least one agent for altering the color of the hair;
  - (a)(2) applying to a portion of hair a treatment composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof;
    - at least one solvent;
- wherein the portions (a)(1) and (a)(2) consist essentially of different portions of hair;
- (b) optionally shampooing and/or rinsing the hair;

- (c) optionally shampooing and/or rinsing the hair;
  - (d) optionally applying to the hair a hair conditioning composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
    - at least one additive; and
  - (e) optionally shampooing and/or rinsing the hair.
50. A hair treatment system comprising:
- (a) a hair treatment composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from malonic acid, maleic acid, and combinations thereof; and
    - at least one solvent; and
  - (b) a hair conditioning composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from oxalic acid, malonic acid, malic acid, glutaric acid, citraconic acid, citric acid, glycolic acid, succinic acid, adipic acid, tartaric acid, fumaric acid, maleic acid, sebacic acid, benzoic acid, and glyoxylic acid monohydrate, and combinations thereof; and
    - at least one additive.
51. A composition for altering the color of the hair, said composition comprising:
- (a) a hair treatment composition comprising:
    - 3-butoxypropylamine;
    - at least one carboxylic acid chosen from malonic acid, maleic acid, and combinations thereof; and
    - at least one solvent; and
  - (b) at least one bleaching agent, at least one colorant compound, or combinations thereof.

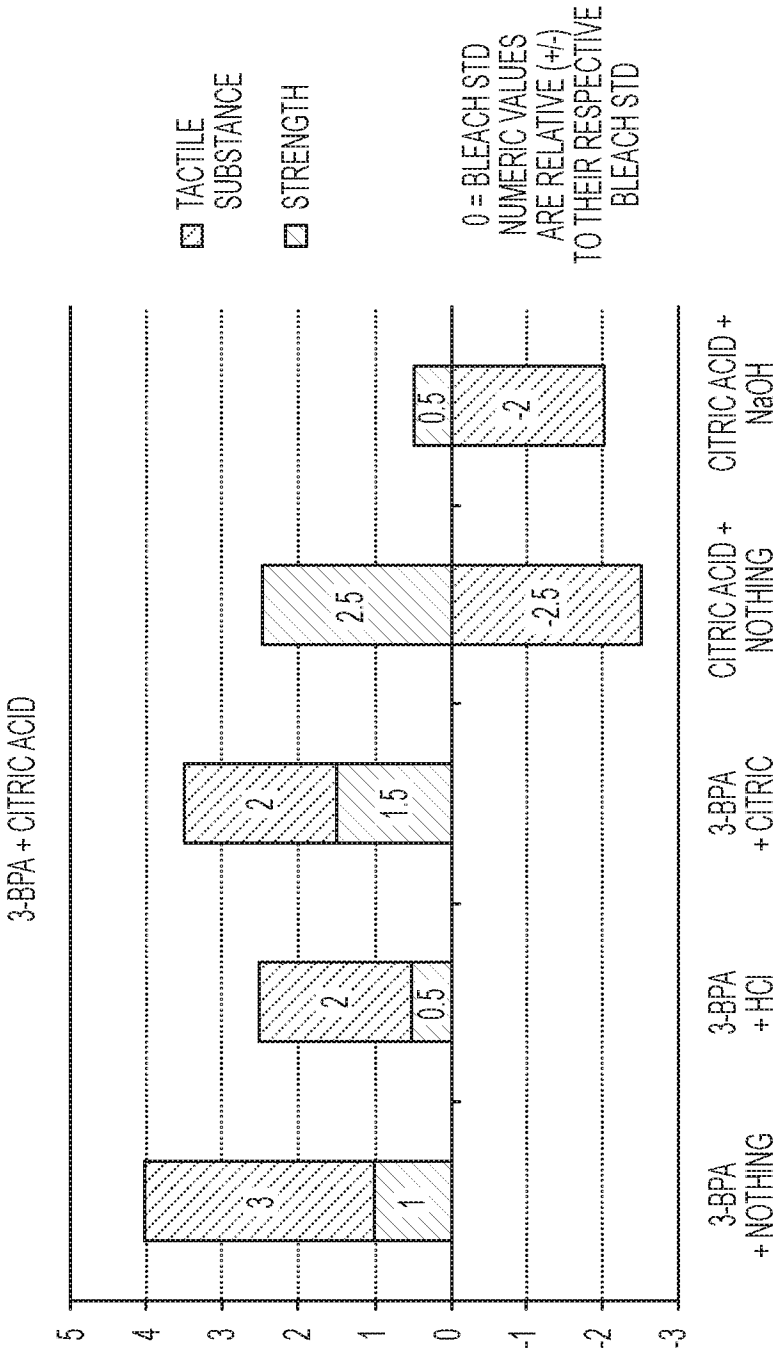


FIG. 1

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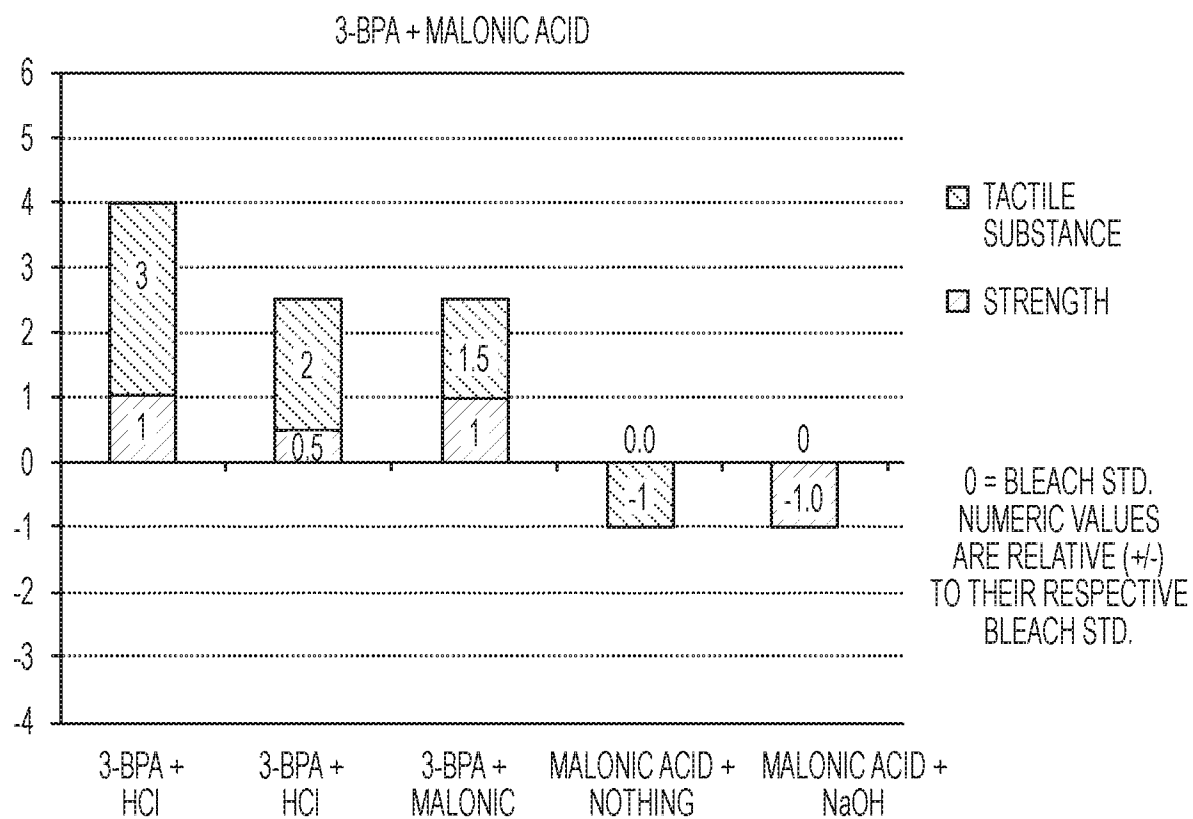


FIG. 2

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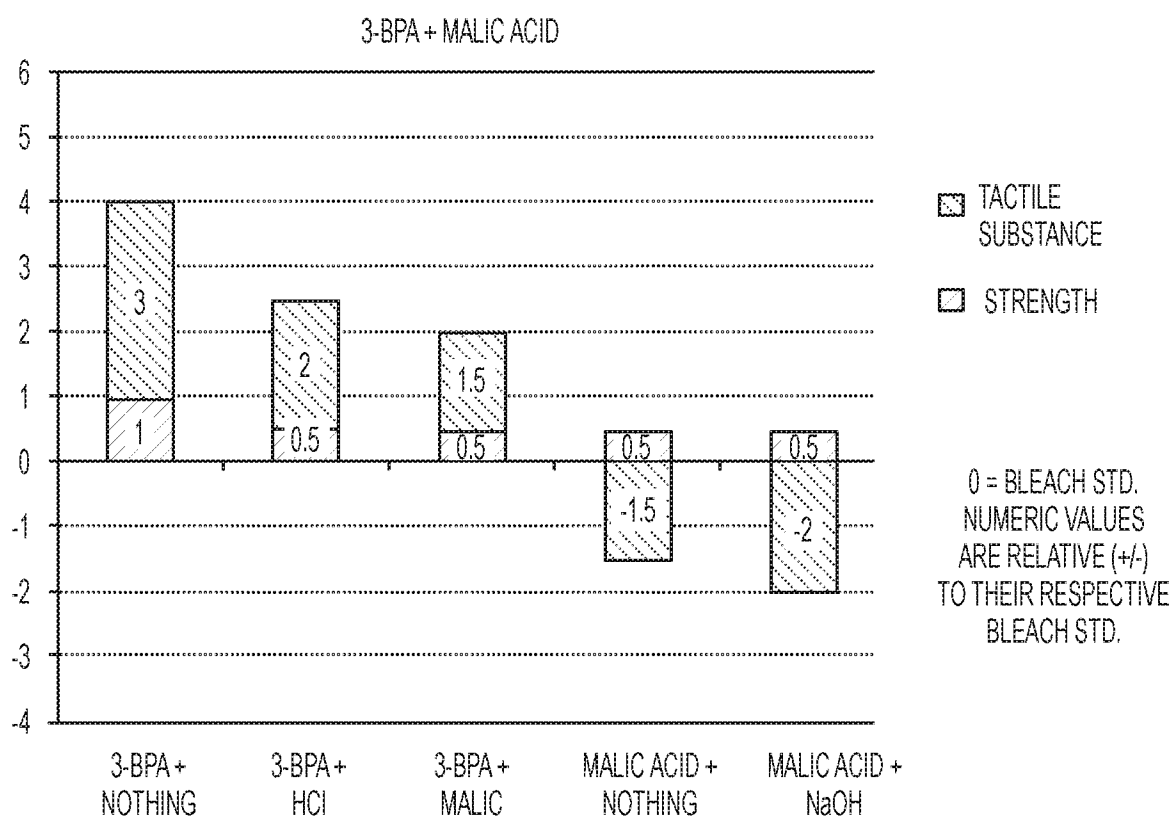


FIG. 3



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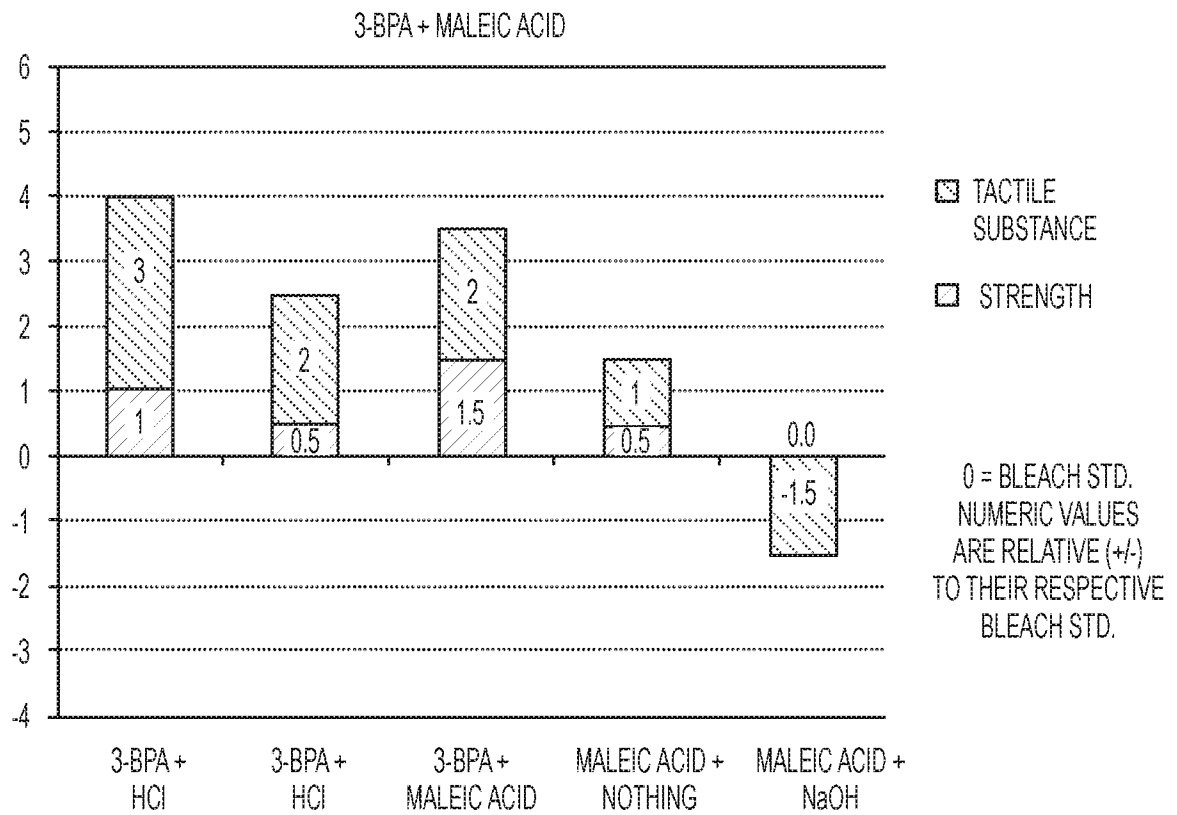


FIG. 4

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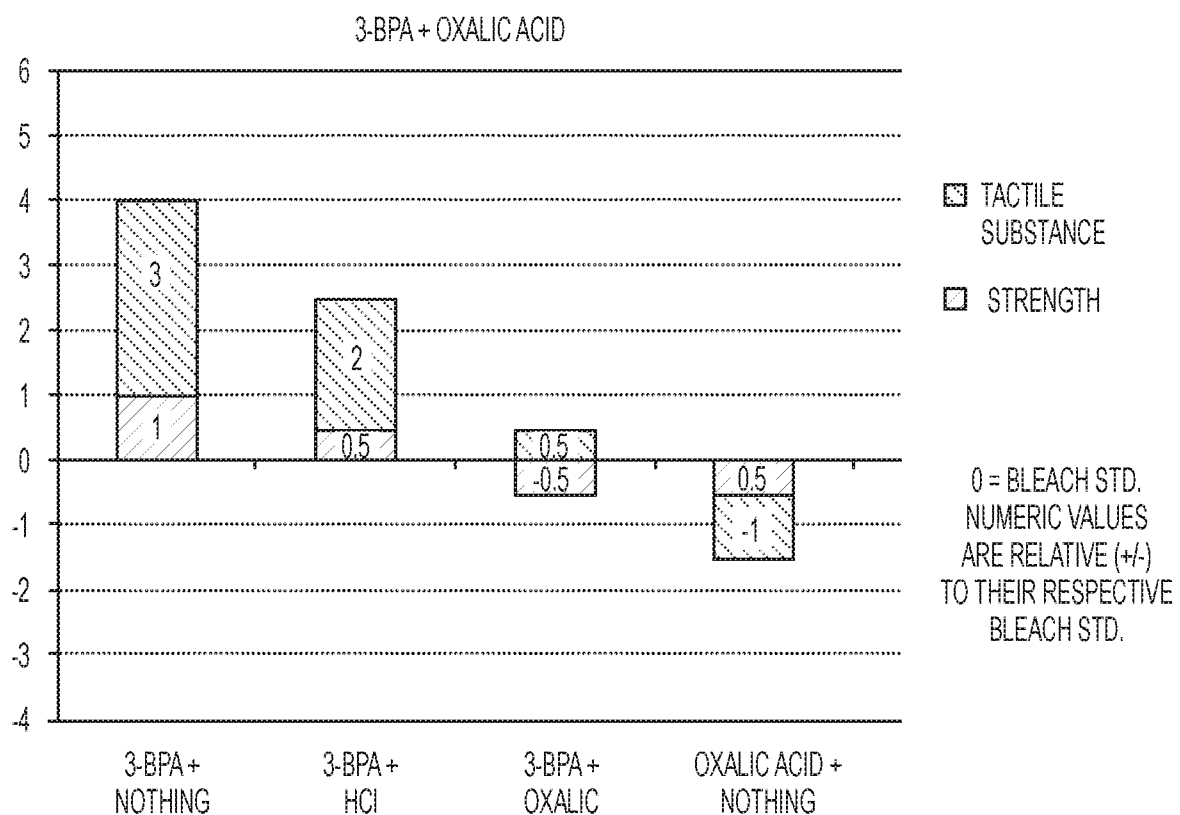


FIG. 5

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/63727

## A. CLASSIFICATION OF SUBJECT MATTER

IPC - A61K 8/22, 8/36, 8/38, 8/41; A61Q 5/04, 5/06, 5/08, 5/10, 5/12 (2017.01)

CPC - A61K 8/22, 8/36, 8/38, 8/41; A61Q 5/04, 5/06, 5/08, 5/10, 5/12

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

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

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

See Search History document

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

See Search History document

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 9,175,114 B2 (LIVING PROOF, INC.) 3 November 2015; column 1, lines 19-23; column 2, lines 15-18; column 13, lines 57-58; column 14, lines 3-4; column 15, lines 65-67; column 17, lines 11-14	1-29, 30/28-29, 31-38, 39/37-38, 40-51
A	US 9,180,086 B2 (CABOURG, J et al.) 10 November 2015; column 2, lines 19-25 and 62-67; column 3, lines 43-45; column 12, lines 37-41; column 40, lines 1-8; column 42, lines 15-25 and 39-48; column 44, lines 65-77; column 45, lines 1-2	1-29, 30/28-29, 31-38, 39/37-38, 40-51
A	US 8,642,659 B2 (SPRINGER, O et al.) 4 February 2014; column 2, lines 64-67; column 3, lines 1-6; column 4, lines 22-23, 41-44, 61; column 5, lines 49-60; column 7, lines 7-9, 66-67; column 25, lines 1-6; column 26, lines 45-50; claim 8	1-22, 24-29, 30/28-29, 31-38, 39/37-38, 40-51
A	US 6,515,050 B1 (MITSUZUKA, M et al.) 4 February 2003; column 1, lines 30-33; column 10, lines 46-49; column 28, lines 30-40	1-27, 44-48, 50
A	WO 2007/038733 A1 (E.I. DUPONT DE NEMOURS AND COMPANY) 5 April 2007; page 2, lines 24-30; page 29, lines 14-19; page 30, line 33; page 37, lines 20-22	23, 28-29, 30/28-29, 49, 51
A	US 7,972,388 B2 (HAMILTON, C et al.) 5 July 2011; column 1, lines 65-67; column 2, lines 1-7; column 6, lines 35-37; column 7, lines 44-47; column 14, lines 63-64	31-35



Further documents are listed in the continuation of Box C.



See patent family annex.

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later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;"

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Date of the actual completion of the international search

10 January 2017 (10.01.2017)

Date of mailing of the international search report

08 FEB 2017

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/63727

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	✓ FR 2 975 899 B1 (LOREAL SA) 6 March 2015; (English translation); page 2, second column, fourth-fifth paragraphs; page 3, second column, fifth-ninth paragraphs; page 4, second column, second-third paragraphs; page 17, eighth paragraph; page 18, third paragraph	36-38, 39/37-38
A	US 2009/0252697 A1 (BARBARAT, P) 8 October 2009; paragraphs [0002], [0067]-[0068], [0074], [0076]	40-43