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STABILIZED OXIDATION DYE COMPOSITIONS
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ABSTRACT OF THE DISCLOSURE

The use of 2,3-dihydroxy naphthalene to stabilize oxidation dyestuff compositions for dyeing human hair, or other keratinaceous or proteinaceous fibers.

Background of the invention

Synthetic organic dyes known as oxidation dyes are widely used for dyeing living human hair because they can be easily applied to produce natural looking shades and have no adverse effects on normal hair. However, many compositions containing an oxidation dye are subject to deterioration especially when in contact with air. Deterioration can occur when the container or the composition is not air tight or is not completely full and has large air spaces in contact with the composition, or when the container for the composition is left open. Deterioration can also occur during the dissolving of the dye and preparation of the solution prior to bottling. Deterioration of the oxidation dye is believed due to the quantity of air, particularly oxygen which is in contact with the composition. Deterioration of the dyeing composition manifests itself by a darkening and by a partial or even complete loss of the dyeing properties of the composition as well as a difference in shade of the hair which has been dyed by such a composition as compared to hair which has been dyed with a composition which has not suffered such deterioration.

In order to prevent deterioration of the oxidation dye stuff composition workers in the field have utilized various reducing substances in these dyestuff compositions. However, these reducing agents have not proven very beneficial in these hair dyeing compositions since many of these reducing agents do not have the ability to prevent the air oxidation of the dye solution. Many antioxidants or reducing agents, when used in quantities high enough to have a stabilizing effect on the oxidation dye, reduce the nitro groups present in some oxidation dyes thus causing a change in the color produced. For instance when sodium sulfite is used as the stabilizing agent at a concentration of one percent or less it will not prevent air oxidation of the solution and if it is used at a concentration higher than one percent it becomes more effective in preventing air oxidation but will cause a color change due to the reduction of the nitro group in such dyes as nitro para phenylene diamine and nitro ortho phenylene diamine. Additionally, many of these reducing agents cause irritation or damage to the scalp and in many cases cause the liberation of excessive heat when the dye solution is mixed with a bleaching material such as hydrogen peroxide. Also it has been found that these reducing agents are not stable to storage and precipitate or separate from the dyestuff solution under storage conditions so that the dyestuff solution loses its ability to prevent air oxidation. In addition to this many of these reducing agents cause color change in the dye solution.

In utilizing bleaching solution for human hair, one of

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the major defects in many bleaching solutions is the tendency of the bleaching solution to climb up the hair shaft away from the scalp when the solution is applied to the head. This tendency increases the amount of bleaching above the new growth of hair which causes over-bleaching of that portion of the hair that has been bleached before. This results in uneven bleaching and hair damage and breakage. It has long been desired to provide an agent which will prevent the tendency of bleach solutions to climb the hair shaft away from the scalp.

Summary of the invention

In accordance with this invention, it has been discovered that when 2,3-dihydroxy naphthalene is added to a dyestuff composition containing an oxidation dyestuff, the tendency of the dyestuff composition to oxidize upon exposure to air is severely reduced. This result is completely unexpected since isomers of 2,3-dihydroxy naphthalene such as 1,5-dihydroxy naphthalene and 2,7-dihydroxy naphthalene do not retard the air oxidation of dyestuff compositions containing oxidation in dyestuffs.

In accordance with a preferred embodiment of this invention, a mixture of 2,3-dihydroxy naphthalene and sodium sulfite is added to a dyestuff composition containing an oxidation dyestuff. This mixture, it has been found, prevents the air oxidation of the dye solution while not reacting with the dye composition and causing color changes. Furthermore, this composition has no tendency to reduce functional groups such as nitro groups which are present in some oxidation dyes. Additionally, it has been found that this mixture does not cause irritation or damage to the scalp nor does it cause the liberation of excess heat when the dyestuff solution containing this mixture is mixed with an oxidizing agent such as hydrogen peroxide. Additionally, the mixture is stable to storage at 0° C. or elevated temperatures or prolonged periods of time so that the mixture does not precipitate or separate from the dyestuff composition under storage conditions.

In addition, it has been found that when 2,3-dihydroxy naphthalene is added to bleaching solutions, the tendency of the solution to climb up the hair shaft away from the which generally occurs with such compositions is eliminated. Therefore by utilizing 2,3-dihydroxy naphthalene in bleaching compositions the danger of over-bleaching, which generally occurs with such compositions is eliminated.

Detailed description of the invention

Beneficial results that are achieved by adding 2,3-dihydroxy naphthalene or a mixture of 2,3-dihydroxy naphthalene and sodium sulfite are obtained in all conventional oxidation dyestuff compositions. Therefore, any conventional oxidation dyestuff composition can be utilized in accordance with this invention. These dyestuff compositions can contain any conventional oxidation hair dyestuff that can be used for the dyeing of human hair. For example, those indicated in the Colour Index, 2nd edition 1956, vol. 3, pages 3593-3601 among the most suitable oxidation hair dyestuff for use in accordance with the present invention are:

para phenylene diamine
2,5-toluene diamine sulphate
chloro para phenylene diamine sulphate

nitro para phenylene diamine
 1,2,4-triamino benzene dihydrochloride
 para amino diphenyl amine
 ortho phenylene diamine
 4-chloro ortho phenylene diamine
 4-nitro ortho phenylene diamine
 5-chloro-3-nitro ortho phenylene diamine
 para aminophenol
 4-amino-2-methyl phenol sulphate
 4-amino-3-methyl phenol
 4-amino-2-nitro-phenol
 2,4-diaminophenol hydrochloride
 para methyl aminophenol sulphate
 ortho aminophenol
 4-chloro-2-aminophenol
 4-nitro-2-aminophenol
 5-nitro-2-aminophenol
 4,6-dinitro-2-aminophenol
 6-chloro-4-nitro-2-aminophenol hydrochloride
 4-amino diphenylamine
 2,4-diamino diphenylamine
 4,4'-diamino diphenylamine sulphate
 meta phenylene diamine
 chloro-meta phenylene diamine
 nitro-meta phenylene diamine
 meta toluylene diamine
 2,4-diamino anisol sulphate
 meta aminophenol
 3,5-diamino phenol hydrochloride
 diethyl meta amino phenol
 para amino ortho cresol

In addition certain hydroxy compounds are used in oxidation dye compositions. These include:

Hydroquinone, resorcinol, chlororesorcinol, pyrogallol, alpha naphthol, 1,5-dihydroxy naphthalene, 2,7-dihydroxy naphthalene.

The beneficial results achieved by this invention are produced by adding to the dyestuff composition containing the oxidation dyestuff from about 0.02% by weight to about 2.0% by weight of 2,3-dihydroxy naphthalene, preferably from 0.025% to 0.2% by weight, in admixture from about 0.2% by weight to 1% by weight of sodium sulfite based upon the total weight of the dyestuff composition including oxidation dyestuff, added ingredients and water or solvents. Generally it is preferred to provide mixture containing 0.1% to 0.2% of 2,3-dihydroxy naphthalene and 0.5% and 1% of sodium sulfite based upon the total weight of the dyestuff composition.

Furthermore, beneficial results can be achieved in accordance with this invention by utilizing 2,3-dihydroxy naphthalene without sodium sulfite. It has been found that 2,3-dihydroxy naphthalene at concentrations of from 0.02% by weight to 2.0% by weight is effective in preventing oxidation of the oxidation dyestuffs in the hair dyeing compositions and preventing color changes in these hair dyeing compositions.

In addition to dyeing human hair, the stabilized dyeing compositions of this invention can also be used to dye other keratinaceous or proteinaceous fibers e.g., animal fibers such as wool, bristles, feathers, silk and hair. However, the stabilized compositions of this invention are particularly advantageous for dyeing living human hair on the head.

In addition to the dye and stabilizers of this invention, the compositions of this invention can contain one or more of the various conventional hair dyeing adjuvants such as surfactants, thickening agents, water, solvents and alkalizing agents.

Quantity of dye in the composition can vary over a wide range such as that of about 0.01% to about 10% by weight of the composition. Thickening agents when used in the compositions can vary over the broad con-

centration used in the hair dyeing art such as from about 1% to about 15% by weight of the total composition and preferably from about 2% to 10% by weight of the total composition. Water dispersable surface active agents including detergents when used in this composition can vary over the broad concentration used in the hair dyeing art which is from about 0.5% to about 30% and preferably from about 1% to about 10% by weight of the total composition.

The quantity of alkalizing agent, if employed, can vary over a wide range depending upon the dye, the particular alkalizing agent, and the desired pH. Thus, the alkalizing agent can vary from less than 0.1% to over 10% and preferably from about 0.5% to about 3% by weight of the total dyeing composition.

The dyeing compositions of this invention generally contain water although they can be formulated with no water present. Generally the compositions can contain from about 5% to 99% by weight of water, depending upon the contemplated particular type of dyeing composition and the physical form of the composition, e.g. paste, slurry, thin liquid etc. In the oxidation dyeing composition the water content preferably varies from about 5% to about 80% and particularly from about 10% to about 50% by weight of the total composition.

Water dispersable surface active agents which can be employed in the compositions of this invention can be anionic, non-anionic or cationic. Illustrative of various types of water soluble surface active agents are included; higher alkyl benzene sulfonates; alkyl naphthalene sulfonates; sulfonated ester, alcohols of polybasic acids; fatty alcohol sulfates; sulfates of branched chain or secondary alcohols; alkyl dimethyl benzylammonium chlorides, polyoxyethylene alkylethers; and the like. Illustrative of specific surfactants there can be mentioned: lauryl sulfate; polyoxyethylene laurate; myristyl sulfates; glyceryl monostearate; sodium salt of palmitic methyl taurine etc. Illustrative of thickening agents there can be mentioned sodium alginate; vegetable gums, such as agar and synthetic thickeners such as sodium carboxymethylcellulose.

The 2,3-dihydroxy naphthalene can be utilized in bleaching solutions as well as with oxidation dyestuff compositions. This additive prevents conventional bleach solutions from climbing up the hair shaft away from the scalp when the bleaching solution is applied to the head. In achieving the beneficial results by the addition of 2,3-dihydroxy naphthalene, any conventional bleaching solution can be utilized. These bleaching solutions contain a conventional bleaching material such as hydrogen peroxide in an amount of from about 0.01% to about 10% by weight of the bleaching solution. Various of the other conventional ingredients such as surfactants and thickening agents as well as carriers and solvents can be utilized in the bleaching composition. In adding the 2,3-dihydroxy naphthalene to the bleaching solution, it has been found that from about 0.05% by weight to about 2.0% by weight of 2,3-dihydroxy naphthalene, based upon the total weight of the bleaching solution, can be added to the bleaching solution. Generally it is preferred to add 2,3-dihydroxy naphthalene to the bleaching solution in an amount of from about 0.1% to about 2.0% by weight, based upon the total weight of the bleaching solution. The total weight of the bleaching solution includes bleaching material such as hydrogen peroxide, carrier or solvent such as water and additional ingredients such as the 2,3-dihydroxy naphthalene, surfactants, lubricants, etc.

The dyeing or bleaching compositions of this invention can be applied to living human hair on the head by the conventional techniques, at the conventional temperatures and for the conventional periods of time. Illustratively, when oxidation dyeing compositions are applied the stabilized composition can be poured on the hair either prior to and preferably after mixing with the peroxide and per-

mitted to remain on the hair for about five minutes to about two hours and preferably about fifteen minutes to about sixty minutes at temperatures from about 20° C. to about 40° C. The stabilized compositions of this invention can be prepared by the conventional method used in the dyeing art. The 2,3-dihydroxy naphthalene alone or in mixture with sodium sulfite can be simply incorporated into the composition such as by simply adding a sufficient effective quantity of this active ingredient to the water or dispersion of the dye in the various adjuvants.

The invention is further illustrated by the following examples:

Example I

This example is directed to showing the effect of 2,3-dihydroxy naphthalene on the oxidation dyestuff 2,5-toluene diamine sulfate.

25 grams of 2,5-toluene diamine sulfate dissolved in 500 cc. of hot water. After a few minutes the solution had a very dark color which showed that the toluene diamine sulfate was badly oxidized.

25 grams of 2,5-toluene diamine sulfate and 0.5 grams of 2,3-dihydroxy naphthalene was dissolved in 500 cc. of hot water. No darkening of the color of the solution was obtained even after the solution had sat around for a day. This demonstrated that 2,3-dihydroxy naphthalene prevented oxidation of the toluene diamine sulfates.

Example II

The following dye composition was prepared:

Material:	Amount
Para toluene diamine sulfate -----grams--	0.8
2,4-diamino anisol sulfate -----do----	0.4
Para amino phenol -----do----	0.4
4-amino 2-nitro phenol -----do----	0.025
Diethylene glycol -----do-----	180.000
Ammonium oleate -----do-----	870.000
Ethylene diamine tetraacetic acid --do----	30.000
Ammonium hydroxide (28%) -----cc--	120.000

130 grams of the above dyeing composition was dissolved in 58 cc. of deionized water and 12 cc. of ethyl alcohol. The stabilizing agent was added to the solution and the solution was mixed with an equal volume of a 20 volume aqueous solution of hydrogen peroxide. The resulting solution before the addition of peroxide was allowed to stand 84 days in ½ filled bottles. The results on the color of the solutions after such standing are noted in the following table. The amount of stabilizer is based upon the weight of solution before addition of hydrogen peroxide.

TABLE

Stabilizing agent	Amount, percent	Effect
Lactose.....	0.5	Dark layer of dye.
Maltose.....	0.5	Do.
Resorcinol.....	0.10	Lightened color.
2,7-dihydroxy naphthalene.....	0.20	Color change.
Sodium phosphite.....	1.0	Oxidation of dye.
Maleic anhydride.....	1.0	Do.
Sodium citrate.....	1.0	Do.
Hydroquinone.....	0.5	Do.
Ammonium oxalate.....	1.0	Do.
Sodium sulfite.....	0.5	Do.
0.5% sodium sulfite and 0.025% 2,3-dihydroxy naphthalene.	-----	Unchanged in color.
1.0% sodium sulfite and 0.1% 2,3-dihydroxy naphthalene.	-----	Do.

Example III

A bleaching solution was prepared containing the following ingredients:

Ingredient:	Amount (percent by weight)
Hydrogen peroxide -----	3.6
Sodium metasilicate -----	1.6
Ethylene diamine tetraacetic acid -----	4.2
Sodium bicarbonate -----	4.2
Non-ionic surfactant (Triton X-100) -----	6.5
Oleic acid -----	10.0
Cationic surfactant (Ethoquad 0/12) -----	6.5
Ammonium hydroxide (27%) -----	3.7

Triton X-100 is alkylphenoxy polyethoxy (9-10 groups) ethanol, wherein the alkyl is either octyl or nonyl (American Perfumer and Cosmetics, vol. 79, No. 3, March 1964, p. 65). Ethoquad 0/12 is polyethoxylated quarternary ammonium salt derived from oleic acid having 2 ethylene oxide groups per mole of acid (Detergents and Emulsifiers, 1963 Annual, p. 62).

This solution was placed in a beaker. The tendency of the solution to climb the beaker was observed. The solution climbed up the beaker indicating the solution puffed up. When 1.0% by weight of 2,3-dihydroxy naphthalene was added to the solution the solution did not puff up and overflow the beaker.

The tendency of a solution to "puff up" in a beaker is a laboratory test that is used to measure the amount of climbing up the hair shaft that will be obtained when the solution is applied to the head.

What is claimed is:

1. A composition for dyeing material selected from the group consisting of human hair, keratinaceous and proteinaceous fibers comprising an oxidation dyestuff adapted upon oxidation to dye said material, from about 0.02% to about 2.0% by weight of 2,3-dihydroxy naphthalene, based upon the weight of said dyeing composition and from 0.2% to 1.0% by weight of sodium sulfite based upon the weight of said dyeing composition.

2. The composition of claim 1 wherein said sodium sulfite is present in an amount of from about 0.5% to 1% by weight and said 2,3-dihydroxy naphthalene is present in an amount of from about 0.1% by weight to about 0.2% by weight.

3. The composition of claim 2 wherein said oxidation dyestuff is para toluene diamine sulfate or para phenylene diamine.

4. A composition for dyeing a material selected from the group consisting of human hair, keratinaceous fibers and proteinaceous fibers comprising an oxidation dyestuff adapted upon oxidation to dye said material, and from about 0.02% to about 2.0% by weight, based upon the weight of said composition of 2,3-dihydroxy naphthalene.

5. The composition of claim 4 wherein said oxidation dyestuff is para toluene diamine sulfate or para phenylene diamine.

6. A composition for bleaching human hair comprising a bleaching agent and from 0.02% to 2.0% based upon the weight of said bleaching composition of 2,3-dihydroxy naphthalene.

7. The bleaching composition of claim 6 wherein said bleaching agent is hydrogen peroxide.

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