

## DESCRIPTION

Title of Invention: AEROSOL-TYPE FOAMY OXIDATIVE HAIR DYE  
COMPOSITION

Technical Field

[0001]

The present invention relates to an aerosol-type foamy oxidative hair dye composition and, more specifically, to an aerosol-type foamy oxidative hair dye composition which includes a first component containing an alkali agent selected from ammonia or an ammonium salt, and a second component containing an oxidizing agent, in which both components are discharged and mixed at the time of application from an aerosol container.

[0002]

{Definitions of Terms}

1) "An oxidative hair dye" refers to a hair dye which includes a first component containing an alkali agent and a dye component (an oxidation dye intermediate, and further, a coupler) and a second component containing an oxidizing agent.

[0003]

2) In an oxidative hair dye, an alkali agent makes hair swell and an oxidizing agent makes melanins in hair decompose (bleaching hair). In parallel, a dye component is made to undergo oxidative polymerization within hair (hair dyeing). Accordingly, with regard

to the oxidative hair dye, when the phrases "hair dyeing power," "hair-dyeing properties" and the like are used, the phrases mean the above-described hair dyeing of the hair.

[0004]

3) When the phrase "an oxidative hair dye" or "an oxidative hair dye composition" is used, the phrase refers to the state before the composition is discharged in a foamy state, and a first component or a second component in this state may be referred to as "a raw liquid." In addition, when the phrase "a foamy oxidative hair dye" or "a foamy oxidative hair dye composition" is used, the phrase refers to the state of the composition discharged in a foamy state by using an aerosol container.

[0005]

4) "Hair" is not particularly limited, but preferably refers to the hair of the head including the face, especially preferably to the hair of the head including the face of a human, and particularly preferably to the hair of the head except for the face on the head of a human.

[0006]

5) With regard to the foamy first component and the foamy second component of the foamy oxidative hair dye, when the phrase "being discharged and mixed" is used, the phrase means that each of these components is "discharged, and thereafter, uniformly mixed by using the fingers and the like." In addition, an aerosol container includes

a type in which the foamy first component and the foamy second component are discharged from separate discharge openings and a type in which the first component and the second component are discharged from a single discharge opening combined together and in which the first component and the second component have already been mixed at the time of discharge to a certain extent, and the above-described term "discharged" includes both of these types of discharge by means of an aerosol container.

#### Background Art

[0007]

Up until now, aerosol-type foamy oxidative hair dye compositions which discharge oxidative hair dye compositions in foamy states by using propellants such as LPG have been known. Such an aerosol-type foamy oxidative hair dye composition is used such that each component of the composition is discharged together with a propellant from an aerosol container in a foamy state.

[0008]

The aerosol-type foamy oxidative hair dye compositions includes a type in which each component of the composition is accommodated in an aerosol container as a raw liquid which is mixed with a propellant, a type in which an aerosol container has an inner package, and each component of the composition and a propellant (for foaming) are accommodated in the inner package, and a propellant

(for extrusion) is accommodated outside of the inner package, and the like.

[0009]

In general, an aerosol-type foamy oxidative hair dye can be used with a simpler operation than liquid and cream formulations and the like because the aerosol-type foamy oxidative hair dye can discharge its components in foamy states just by pushing the button of the aerosol container upon its use. In addition, the aerosol-type foamy oxidative hair dye has another advantage in that it can make it possible to use a required amount by subdividing to multiple times.

[0010]

An aerosol-type foamy oxidative hair dye composition includes a first component containing an alkali agent and a dye component and a second component containing an oxidizing agent. In addition, each component containing each of the first component and the second component is separately accommodated in the aerosol container, and both components are discharged in foamy states and mixed at the time of application. Representative examples of the above-described alkali agent include ammonia and an ammonium salt, and representative examples of the above-described oxidizing agent include hydrogen peroxide.

[0011]

With regard to such an aerosol-type foamy oxidative hair dye

composition, the following Patent Literature 1 discloses an aerosol-type foamy oxidative hair dye composition which further contains a nonionic surfactant exhibiting a specific HLB value to achieve a good foamy state and a strong hair dyeing power. The following Patent Literature 2 discloses a two-component type foamy hair dye composition which contains a decreased amount of ammonia in a first component or which contains a substance other than ammonia such as an alkanolamine as an alkali agent in the first component. On the other hand, the following Patent Literature 3 discloses a foamy hair dye composition which contains a surfactant, a straight-chain higher alcohol, and at least one of a branched higher alcohol and a hydrocarbon having a branched chain in a first component or a second component, and of which the foam specific gravity at 25° C is set to 0.02 - 0.30. This foamy hair dye composition can prevent the liquid from dripping and can uniformly dye or bleach the hair.

[0012]

Further, as disclosed in the following Patent Literature 4, an aerosol-type foamy hair dyeing/bleaching composition, which can suppress irritating odor, can make the hair have a pleasant feel after hair dyeing or bleaching treatment, and can exhibit improved foam-forming properties at a low temperature, has been known. Furthermore, Patent Literature 4 discloses an aerosol-type foamy hair dyeing/bleaching composition which contains a specific

surfactant and a specific alkaline component as essential components such that the composition exhibits advantageous effects.

[0013]

In addition, a wide variety of aerosol containers including an aerosol container disclosed in the following Patent Literature 5 have been known. The aerosol container disclosed in the following Patent Literature 5 includes a simultaneous mixing-discharging mechanism and includes two cans and a head portion as constituents, and in the aerosol container, a first component containing an alkali agent and a second component containing an oxidizing agent are accommodated in separate cans together with a propellant. By pressing a lever 30d of the aerosol container, a discharge portion 30c is made to be conducted to the outside, and the first component and the second component reach a mixing passage 30m from each can 30f, through a stem 30j and a communication hole 30l, respectively, and then are mixed together to be discharged from the discharge portion 30c as a foamy formulation.

[0014]

In addition, it has been conducted that a raw liquid of each component of a multi-component type aerosol-type foamy oxidative hair dye is made to be a solubilized system, but it tends to cause decrease in the hair dyeing power.

Citation List

## Patent Literature

[0015]

Patent Literature 1: JP 11-139945 A

Patent Literature 2: JP 2002-284655 A

Patent Literature 3: JP 2003-073240 A

Patent Literature 4: JP 2010-280580 A

Patent Literature 5: JP 2002-284655 A

## Summary of Invention

### Technical Problem

[0016]

(The first problem)

Incidentally, ammonia and an ammonium salt are suitable alkali agents in order for an oxidative hair dye to achieve excellent hair dyeing power, but there is a disadvantage of the unpleasant irritating odor due to the volatility of ammonia. In addition, when an oxidative hair dye is an aerosol-type foamy oxidative hair dye, such an irritating odor is especially strong.

[0017]

For example, the aerosol-type foamy oxidative hair dye composition disclosed in Patent Literature 1 achieves good foamy states and strong hair dyeing powers as described above, but the composition contains ammonia as an alkali agent, and therefore, there has been still room for improvement in terms of decrease in

the irritating odor. The two-component type foamy hair dye composition disclosed in Patent Literature 2 can suppress the irritating odor by decreasing the amount of ammonia contained in the composition, or by adding an alkali agent other than ammonia, but there has still been room for improvement in that there may be relative decreases in hair dyeing powers and brightness of color of hair. The foamy hair dye composition disclosed in Patent Literature 3 employs ammonia and the like as an alkali agent in order to ensure a hair bleaching (improvement of brightness of color of hair) effect, and the foam specific gravity is defined, but this foam specific gravity is defined from the point of view of preventing the liquid from dripping, and in this Patent Literature, the relationship between the foam specific gravity and decrease in the irritating odor has not been studied.

[0018]

An object of the present invention is to provide an aerosol-type foamy oxidative hair dye which can maintain good hair-dyeing properties and which can suppress the irritating odor of ammonia. In addition, in an aerosol-type foamy oxidative hair dye in which a first component and a second component are discharged/mixed in foamy states at the time of application, good mixability of the foamy first component and the foamy second component is also extremely important for good hair-dyeing properties.

[0019]

Accordingly, the first problem to be solved by the present invention is to suppress the irritating odor of ammonia, to ensure the good mixability of a first component and a second component, both of which are discharged and mixed at the time of application in foamy states, and to maintain good hair-dyeing properties in an aerosol-type foamy oxidative hair dye composition which includes the first component containing an alkali agent selected from ammonia or an ammonium salt, the first component being discharged and mixed with the second component, both in foamy states, at the time of application.

[0020]

Up until now, in order to solve the technical problem of suppressing the irritating odor of ammonia, it has been commonplace that the amount of ammonia contained in the composition is decreased or that an alkali agent such as an alkanolamine is employed instead of ammonia, as disclosed in Patent Literature 2, but in such cases, there has been a disadvantage of sacrificing hair dyeing power and brightness of color of hair.

[0021]

The present inventors were able to gain an extremely unique viewpoint of studying the relationship between foam specific gravities (sizes of foams) of a first component and a second component at the time of discharge and the irritating odor of ammonia in the process of pursuing means for solving the above-described technical

problem. In addition, the present inventors obtained the following novel findings in the process of pursuing this viewpoint. The first group of aspects of the invention of the present application was completed based on these novel findings.

[0022]

(Premise) According to common general technical knowledge, regarding a foamy discharged material, when its foam specific gravity is small (when foam is large), the foams tend to be easily broken. Accordingly, in a foamy oxidative hair dye, it is thought that when a foam of a foamy first component containing ammonia is large, the irritating odor of ammonia tends to be strong due to release of ammonia caused by breaking of the foam.

[0023]

(Finding 1) However, according to the experiments conducted by the present inventors, the present inventors obtained results unexpected from common general technical knowledge up to now; that is, when the foam specific gravity of a foamy first component is smaller than that of a foamy second component (when the foam size of the foamy first component is larger than that of the foamy second component), the irritating odor of ammonia can be effectively suppressed, and inversely, when the foam specific gravity of the foamy first component is larger than that of the foamy second component (when the foam size of the foamy first component is smaller than that of the foamy second component), the irritating odor of ammonia

cannot be suppressed, as shown by Comparative Example 1 on Table 5 hereinbelow.

[0024]

(Finding 2) Meanwhile, in the above-described Comparative Example 1, since the absolute values of foam specific gravities of the foamy first component and of the foamy second component are set to be rather small (the foam sizes of the foamy first component and of the foamy second component are set to be rather large), regarding the above-described "Finding 1," it might be possible to reason that "in short, since the absolute value of the foam specific gravity of the foamy first component is small (the foam size of the foamy first component is large), it is merely impossible to suppress the irritating odor of ammonia using common general technical knowledge up to now, and the difference between the foam specific gravities (the sizes of foams) of the foamy first component and the foamy second component is irrelevant." Accordingly, the present inventors further studied a Comparative Example, though not being shown on any Table hereinbelow, in which "the foam specific gravity of the foamy first component is greater than that of the foamy second component (the foam size of the foamy first component is smaller than that of the foamy second component), as well as the absolute values of foam specific gravities of the foamy first component and of the foamy second component are rather large (the foam sizes are

rather small)" and the composition of the Comparative Example could not suppress the irritating odor of ammonia, as expected.

[0025]

(Finding 3) The reason why the above-described experimental results were obtained has not been sufficiently explained yet, but reasonable assumptions such as the following Assumption 1 and Assumption 2 are possible.

[0026]

Assumption 1: First of all, in the experiments according to Examples, foams of the foamy first component with a small foam specific gravity (foams of which size is large) are easily broken to release ammonia, but only one part of the foam is actually broken. The large part of unbroken foam exhibits great effects of encompassing/enclosing ammonia due to the large size of foams. In addition, ammonia released from a part of foam which is broken is rapidly absorbed into foams of the foamy second component, which has a large foam specific gravity (small foam size) and is difficult to break and, as a result, the irritating odor of ammonia can be efficiently suppressed.

[0027]

Assumption 2: On the other hand, in the experiments according to Comparative Examples, foams of the foamy first component with a great foam specific gravity (small foam size) do not break easily, but the foams of the foamy first component cannot efficiently

encompass/enclose ammonia because of the small size of the foams and therefore the foams tend to make ammonia volatilize because of a different reason than Assumption 1. This volatilization effect of ammonia is unavoidable in all foams of the first component regardless of the presence of breaking of foams. Even though ammonia thus volatilized from all the foams of the first component is absorbed into foams of the foamy second component, foams of the second component are relatively large and are easily broken in such a case, and as a result, ammonia tends to be released and then the irritating odor of ammonia cannot be efficiently suppressed accordingly.

[0028]

(Finding 4) Meanwhile, when foams of a foamy oxidative hair dye are small, the hair dye tends to be difficult to uniformly apply on the hair because of bad spread during application on the hair, and the hair dye tends to exhibit impaired operability, for example, the hair dye tends to easily slip down from the fingers and the hair. However, when foams of the first component are large, the resulting foams which are obtained after being mixed with foams of the second component become also large as a whole, and the advantage of improved operability cannot be ignored.

[0029]

(Finding 5) In addition, when foam specific gravities (sizes of foams) of the first component and of the second component are excessively different, the uniform mixing of both components tends

to be difficult, and then the hair dyeing power of the oxidative hair dye tends to be impaired.

[0030]

(The second problem)

The present inventors have further conducted studies and have unexpectedly found that the combined use of a component containing a higher alcohol with C14 or less (with the number of carbon atoms of C14 or less) and another component containing a higher alcohol with C16 or more can improve the quality of foams and can improve the hair dyeing power. In addition, the present inventors have found that it is preferable to make each component of such an oxidative hair dye composition an emulsified material, and to use each component which is the emulsified material by being discharged in a foamy state by using an aerosol container. The quality of foams of the discharged foamy oxidative hair dye composition is elastic and glutinous, and the foams exhibit excellent hair dyeing power. The glutinous quality of foams made it possible to improve operability, for example, to prevent the liquid from dripping upon the application.

[0031]

Accordingly, the second problem to be solved is to provide an excellent aerosol-type foamy oxidative hair dye composition.

[0032]

(The third problem)

In an aerosol-type foamy oxidative hair dye composition, the

stability of formulations such as an emulsified material upon storage is important. In particular, in order to take advantage of possible usage after subdividing into multiple times, the improvement of the stability is important. When an emulsified material contains an oxidation dye, the stability tends to be impaired, and therefore, there has been still room for improvement of the stability of an emulsified material.

[0033]

The stability of an emulsified material is also important for discharging fine-textured foams. When both a first component and a second component can be discharged as fine-textured foams, the texture of the resulting mixture also tends to be fine, and the mixture tends to exhibit good operability. On the other hand, when the texture of foams of the first component or of the second component is course, texture of foams of the resulting mixture tends to be course, and the mixture tends to exhibit poor operability.

[0034]

In general, a higher alcohol having a large number of carbon atoms tends to contribute to the improvement of the hair dyeing power but tends to make the texture of foams course. Accordingly, there is a possibility that good hair dyeing, by decreased operability, for example, cannot be achieved even when a higher alcohol having a large number of carbon atoms is admixed. In addition, a higher alcohol having a small number of carbon atoms tends to make the

texture of foams fine, but an alcohol with a small number of carbon atoms tends to decrease the hair dyeing power. Accordingly, achieving both fine-textured foams and improvement of the hair dyeing power is important for an aerosol-type foamy oxidative hair dye composition.

[0035]

As described in Example 6, Example 8, and the like, of the above-described Patent Literature 3, a foamy hair dye composition containing a higher alcohol with C20 or more (behenyl alcohol) and a higher alcohol with C18 or less (hexyldecanol) has been present. However, there has been still room for improvement with regard to the stability of the emulsified material. Example 6 and Example 8 of the above-described Patent Literature 3 are different in the mass ratio of a nonionic surfactant to a higher alcohol from a component (A) contained in the aerosol-type foamy oxidative hair dye composition disclosed in the present application.

[0036]

As disclosed in Examples of the above-described Patent Literature 4, an aerosol-type foamy hair dyeing/bleaching composition containing a higher alcohol with C18 or less (cetanol, isostearyl alcohol) has been present. However, there has been still room for improvement with regard to the hair dyeing power.

[0037]

The present inventors have conducted intensive studies, and as a result, have found unexpectedly that an aerosol-type foamy oxidative hair dye composition, which has excellent stability of an emulsified material, which gives fine-textured foams, and which exhibits excellent hair dyeing power can be achieved by making the composition contain, as a constituent, a component containing a nonionic surfactant, a higher alcohol with C20 or more, and a higher alcohol with C18 or less together, and by making the mass ratio of the nonionic surfactant to the higher alcohol in a certain range.

[0038]

Accordingly, the third problem to be solved is to provide an aerosol-type foamy oxidative hair dye composition of which an emulsified material exhibits good stability, and that has strong hair dyeing power and excellent quality of foams.

Solution to Problem

[0039]

{The first group of aspects of the invention to solve the first problem}

(The first aspect of the invention)

The constitution of the first aspect of the invention to solve the first problem is an aerosol-type foamy oxidative hair dye composition, the composition comprising:

a first component containing an alkali agent selected from ammonia

or an ammonium salt, and  
a second component containing an oxidizing agent,  
wherein both components are discharged at the time of application  
in foamy states and mixed,  
and wherein the ratio of a foam specific gravity of the first component  
(f1) to a foam specific gravity of the second component (f2), that  
is  $f2/f1$ , is in the range of 1.1 - 3 at the time of discharge of  
the aerosol-type foamy oxidative hair dye composition.

[0040]

Meanwhile, the phrase "foam specific gravity" means a value  
obtained by dividing the weight (gram) of the first component or  
the second component discharged in a foamy state by the volume (ml)  
of the respective component at a certain temperature (preferably  
25° C). The method for measuring a foam specific gravity is not  
limited as long as the method can measure the foam specific gravity  
precisely. For example, when an aerosol container which discharges  
the first component and the second component from separate discharge  
openings in foamy states is employed, the first component or the  
second component which is discharged in a foamy state at a certain  
temperature can be easily obtained separately. And then, if such  
a foamy first component or a foamy second component is immediately  
(before beginning of the defoaming) metered and added into a wide  
mouth container of which the volume and the weight are known such  
that the foams fully fill the container, the volume value (ml) of  
the foams can be obtained. Next, the weight of the container with

the foams is measured and the known weight of the container itself is subtracted, thereby making it possible to obtain the weight value (gram) of the foams. Accordingly, a foam specific gravity can be precisely calculated. If there is a hydrometer, which can directly measure a specific gravity, and which can be applied for the measurement of a foam specific gravity, such a hydrometer may be used.

[0041]

(The second aspect of the invention)

The constitution of the second aspect of the invention to solve the first problem is the aerosol-type foamy oxidative hair dye composition according to the above-described first aspect of the invention, in which the first component and the second component further contain a higher alcohol, and the ratio of the content of the higher alcohol in the first component ( $a_1$ ) to the content of the higher alcohol in the second component ( $a_2$ ), that is  $a_2/a_1$ , is in the range of 0.5 - 2.0.

[0042]

{The second group of aspects of the invention to solve the second problem}

(The third aspect of the invention)

The constitution of the third aspect of the invention to solve the second problem is an aerosol-type foamy oxidative hair dye composition of which multiple components are discharged at the time

of application and mixed, in which the multiple components comprise a component a which is an emulsified material containing a higher alcohol with C16 or more and a component b which is an emulsified material containing a higher alcohol with C14 or less.

[0043]

(The fourth aspect of the invention)

The constitution of the fourth aspect of the invention to solve the above-described second problem is the aerosol-type foamy oxidative hair dye composition according to the third aspect of the invention, in which the component b further contains a higher alcohol with C16 or more.

[0044]

(The fifth aspect of the invention)

The constitution of the fifth aspect of the invention to solve the second problem is the aerosol-type foamy oxidative hair dye composition according to the fourth aspect of the invention, in which the mass ratio of the higher alcohol with C16 or more to the higher alcohol with C14 or less in the component b, that is the higher alcohol with C16 or more/the higher alcohol with C14 or less, is 3 - 20.

[0045]

(The sixth aspect of the invention)

The constitution of the sixth aspect of the invention to solve the second problem is the aerosol-type foamy oxidative hair dye

composition according to any one of the third aspect of the invention to the fifth aspect of the invention, in which the component b contains a surfactant, and the mass ratio of the content of the surfactant to the content of the higher alcohol in the component b, that is the surfactant/the higher alcohol, is 1 or less.

[0046]

The term "a higher alcohol" used in the context of the sixth aspect of the invention includes a higher alcohol with C16 or more and a higher alcohol with C14 or less. The surfactant includes a nonionic surfactant, an anionic surfactant, a cationic surfactant and an amphoteric surfactant.

[0047]

{The third group of aspects of the invention to solve the third problem}

(The seventh aspect of the invention)

The constitution of the seventh aspect of the invention to solve the third problem is an aerosol-type foamy oxidative hair dye composition of which multiple components are discharged at the time of application and mixed, the aerosol-type foamy oxidative hair dye composition comprising a component which satisfies the following condition (A) as a constituent:

(A) an emulsified material which contains a nonionic surfactant, a higher alcohol with C20 or more and a higher alcohol with C18 or less, in which the mass ratio of the nonionic surfactant to the

higher alcohol, that is the nonionic surfactant/the higher alcohol, is 1.5 - 50.

[0048]

(The eighth aspect of the invention)

The constitution of the eighth aspect of the invention to solve the third problem is the aerosol-type foamy oxidative hair dye composition according to the seventh aspect of the invention, in which a viscosity of the component which satisfies the above-described condition (A) is 2,000 mPa·s or less.

[0049]

(The ninth aspect of the invention)

The constitution of the ninth aspect of the invention to solve the third problem is the aerosol-type foamy oxidative hair dye composition according to the seventh aspect of the invention or the eighth aspect of the invention, in which the mass ratio of the higher alcohol with C20 or more to the total higher alcohols in the component which satisfies the above-described condition (A) is 0.005 - 0.9.

Advantageous Effects of Invention

[0050]

{The effects of the first group of aspects of the invention}

In the first aspect of the invention, the ratio of the foam

specific gravity of the first component ( $f_1$ ) to the foam specific gravity of the second component ( $f_2$ ), which is  $f_2/f_1$ , at the time of discharge is in the range of 1.1 - 3. In other words, the foam specific gravity of the foamy first component is relatively small (foams of the first component are large) and the foam specific gravity of the foamy second component is relatively large (foams of the second component are small). Accordingly, because of the reasons explained in the above-described "findings," the composition can effectively suppress the irritating odor of ammonia. In addition, since foams of the first component are large, foams obtained after the foams of the first component are mixed with foams of the second component are large as a whole, as explained in the above-described "findings." Therefore, an important advantage of improvement of operability can be achieved. When the ratio of foam specific gravities, i.e.  $f_2/f_1$ , is less than 1.1, the irritating odor of ammonia cannot be effectively suppressed.

[0051]

On the other hand, the foam specific gravity of the second component ( $f_2$ ) does not exceed three times the foam specific gravity of the first component ( $f_1$ ), and therefore, the foam specific gravities (sizes of foams) of both components are not excessively different, which ensures good mixability of the foamy first component and the foamy second component, as explained in the above-described "findings," and which does not cause a decrease in hair dyeing power

due to bad mixability. When the ratio of foam specific gravities, i.e.  $f_2/f_1$ , exceeds 3, the hair dyeing power of the foamy oxidative hair dye tends to be decreased.

[0052]

Accordingly, by preparing an aerosol-type foamy oxidative hair dye composition which satisfies the objective indicator according to the first aspect of the invention, that is, the ratio of the foam specific gravity of the first component ( $f_1$ ) to the foam specific gravity of the second component ( $f_2$ ), i.e.  $f_2/f_1$ , is in the range of 1.1 - 3, the problem of the present invention, that is, "to suppress the irritating odor of ammonia, to ensure good mixability of the first component and the second component discharged at the time of application in foamy states and to maintain good hair-dyeing properties," can be solved.

[0053]

In other words, the prerequisite of the first aspect of the invention is to provide an aerosol-type foamy oxidative hair dye composition which comprises a first component containing an alkali agent selected from ammonia or an ammonium salt and a second component containing an oxidizing agent, in which both components are discharged in foamy states and mixed at the time of application. The further specific, objective and novel requisite is the indicator that " $f_2/f_1$  is in the range of 1.1 - 3." Then, the first aspect of the invention is an aspect of the present invention which provides

an aerosol-type foamy oxidative hair dye composition which can solve the problem of the present invention by its constituent which satisfies such a requisite.

[0054]

Compositions of the first component and the second component which tend to satisfy or which actually satisfy the above-described indicator are supported by the description in the section entitled "Description of Embodiments" and the section entitled "Examples" hereinbelow.

[0055]

However, the essence of the first aspect of the invention is not such a specific individual example of these compositions, but consists in "an aerosol-type foamy oxidative hair dye composition which satisfies the indicator that  $f2/f1$  is in the range of 1.1 - 3." In addition, those skilled in the art can easily confirm whether an aerosol-type foamy oxidative hair dye composition satisfying such the indicator could be prepared or not by merely discharging the foamy first component and the foamy second component separately, and checking their foam specific gravities.

[0056]

According to the second aspect of the invention, the first component and the second component further comprise a higher alcohol, in which the ratio of the content of the higher alcohol in the first component ( $a1$ ) to the content of the higher alcohol in the second

component (a2), that is  $a_2/a_1$ , is in the range of 0.5 - 2.0. In general, it can be expected that the higher alcohol itself exhibits effects of adjusting the viscosity of the oxidative hair dye composition, and of adjusting the hardness of foams based on the adjustment of the viscosity and the like, but by making  $a_2/a_1$  in the range of 0.5 - 2.0, in other words, by making the contents of higher alcohols in the first component and the second component be in the range not exceeding 2-fold each other, the mixability of the foamy first component and the foamy second component, and therefore, the hair dyeing power of the foamy oxidative hair dye are further improved.

[0057]

{The effects of the second group of aspects of the invention}

The quality of foams of the aerosol-type foamy oxidative hair dye composition according to the second group of aspects of the invention is glutinous and the aerosol-type foamy oxidative hair dye composition according to the second group of aspects of the invention exhibits excellent hair dyeing power.

[0058]

{The effects of the third group of aspects of the invention}

The aerosol-type foamy oxidative hair dye composition according to the third group of aspects of the invention is excellent in stability of an emulsified material, is able to give fine textured foams and is also excellent in hair dyeing power.

## Description of Embodiments

[0059]

Next, the embodiments for carrying out the present invention including the best form of the embodiments are explained, with reference to the drawings. In the present specification, "the present invention" refers to all of the first group of aspects of the invention to the third group of aspects of the invention. The technical scope of the present invention is not limited by the following embodiments.

[0060]

{The aerosol-type foamy oxidative hair dye composition according to the present invention}

(The constitution and the forms of use of the oxidative hair dye composition)

The oxidative hair dye composition according to the present invention is as described in the section entitled "Definitions of Terms" in the beginning of the present specification. The oxidative hair dye composition is a multi-component type. The oxidative hair dye composition may be a two-component type or may be a multiple component type, i.e., a three or more-component type. The oxidative hair dye composition is preferably a two-component type, and normally is composed of a two-component type composition which comprises a first component containing an alkali agent and a dye component

and a second component containing an oxidizing agent.

Since it is necessary to mix the first component containing the alkali agent and the second component containing the oxidizing agent immediately before use, the first component and the second component are packaged separately. The first component and the second component may be included in separate aerosol containers. When the two components are discharged by the power of a propellant, the propellant expands to form foams.

[0061]

The term "a mixture" of the aerosol-type foamy oxidative hair dye composition according to the present invention refers to the mixture of multiple components which constitute the aerosol-type foamy oxidative hair dye composition. The mixture of the aerosol-type foamy oxidative hair dye composition disclosed in the present application is often foamy because the multiple components are discharged from an aerosol container at the time of application. However, the term may also refer to the broken mixture after being applied to the hair.

[0062]

The formulation of a raw liquid of each component constituting the oxidative hair dye is not limited, but the formulation which can easily make foams containing water as a base material is preferable. The formulations of the first component and the second component of the oxidative hair dye according to the first group of aspects

of the invention are not limited as long as they are liquid, but examples of the formulations include a solubilized material (a solution), an emulsified liquid, a gel, and the like. In particular, an emulsified liquid is preferable. In the oxidative hair dye according to the second group of aspects of the invention, the formulations of the component a and of the component b are emulsified liquids. The formulations of the first component and of the second component in the oxidative hair dye according to the third group of aspects of the invention are emulsified liquids when they are components satisfying the condition (A), but when they are not, the formulations of the first component and of the second component are not particularly limited, and examples of the formulations include, for example, a liquid such as a solution, an emulsified liquid, a gel and the like. However, an emulsified liquid is preferable. Meanwhile, when the oxidative hair dye includes a third component and the like in addition to the first component and the second component, the third component and the like may be liquid or may be powdered or granular. The third component and the like may be provided, for example, as a small package attached to an aerosol container in which the first component and the second component are filled.

[0063]

Each component constituting the oxidative hair dye composition contains an appropriate amount of a known propellant such as LPG (liquefied petroleum gas), dimethyl ether, nitrogen, carbon dioxide

and the like. These propellants may be contained in the raw liquid of each component, or otherwise an aerosol container having an inner package may accommodate the raw liquid and the propellant (for foaming) inside the inner package and may accommodate the propellant (for extrusion) outside the inner package. The amount of the propellant thus used is not limited, but the amount of the propellant may be, for example, within the range of 2 - 10 mass% in the raw liquid of each component containing the propellant.

[0064]

In addition, the amount of the propellant contained in the first component of the oxidative hair dye composition may be greater than that contained in the second component. For example, the amount of the propellant in the raw liquid of the first component may be greater by around 1 - 2 mass% than the amount of the propellant in the raw liquid of the second component.

[0065]

The mixing ratio of the foamy first component to the foamy second component is not particularly limited and, for example, the mixing mass ratio of the first component to the second component may be 1 : 1, or the mixing mass ratio of the first component to the second component may be appropriately set in the range of around 1 : 2 - 2 : 1.

[0066]

At the time of the application of the two-component type oxidative hair dye composition as described above, the first component and the second component are discharged in foamy states and mixed, and the composition is used by being applied on the hair. Specifically, the forms of use such as the following (1) - (4) may be exemplified. Upon use, foamy discharged materials of both components, after being discharged, are preferably applied on the hair by being mixed well with the fingers and the like, and then being taken on hands, a brush, or a comb and the like, however foamy discharged materials of both components may also be directly applied on the hair, and thereafter, they may be mixed on the hair. The subject of application may be the entirety of the hair such as the hair of the head, or may be a part of the hair.

[0067]

(1) Both components are discharged from an aerosol container separately in foamy states and are mixed to be applied on the hair.

[0068]

(2) Both components are discharged from an aerosol container separately in foamy states and are applied on the hair, and thereafter, they are mixed on the hair.

[0069]

(3) Both components are discharged from a single discharge opening of an aerosol container, and thereafter, they are further uniformly mixed and are applied on the hair.

[0070]

(4) Multiple components are mixed within an aerosol container or a head portion of the aerosol container, and the resulting mixture is discharged from the aerosol container, and thereafter, they are applied on the hair.

[0071]

After being discharged, each component or a mixture is preferably temporarily taken on hands or a brush and is thereafter applied on the hair, or otherwise is preferably directly applied on the hair. In this regard, when hands are used, it is preferable to wear gloves. The area where the foams are applied may be the entirety of the hair, or may be only a specific part of the hair.

As described above, the present invention also discloses a method for hair dyeing by using an aerosol-type foamy oxidative hair dye composition.

[0072]

{Embodiments of the aerosol-type foamy oxidative hair dye composition according to the first group of aspects of the invention}  
(The foam specific gravity of a foamy oxidative hair dye composition)

When the first component and the second component of the oxidative hair dye composition are discharged from an aerosol container in foamy states, the ratio of the foam specific gravity of the first component ( $f_1$ ) to the foam specific gravity of the second component ( $f_2$ ), i.e.  $f_2/f_1$  is in the range of 1.1 – 3. Taking

this feature as a premise, the foam specific gravity of the first component (f1) is preferably in the range of 0.03 - 0.2, and the foam specific gravity of the second component (f2) is preferably in the range of 0.06 - 0.4.

[0073]

(Examples of the constitution of the oxidative hair dye composition)

(1) Specific examples of the constitution of the oxidative hair dye composition include an aerosol-type foamy oxidative hair dye composition, which comprises a first component containing an alkali agent selected from ammonia or an ammonium salt, and a second component containing an oxidizing agent, in which both components are discharged in foamy states at the time of application and mixed, in which the ratio of the foam specific gravity of the first component (f1) to the foam specific gravity of the second component (f2), i.e.  $f2/f1$ , at the time of discharge of the oxidative hair dye composition is in the range of 1.1 - 3. The ratio of the foam specific gravities, i.e.  $f2/f1$ , is more preferably in the range of 1.3 - 2.8.

[0074]

(2) Other specific examples of the constitution of the oxidative hair dye composition include an aerosol-type foamy oxidative hair dye composition, which comprises a first component containing an alkali agent selected from ammonia or an ammonium salt, and a second component containing an oxidizing agent, in which

both components are discharged at the time of application in foamy states and mixed, and the oxidative hair dye composition further comprising water, a surfactant and a propellant, and in which at the time of discharge of the oxidative hair dye composition, the ratio of the foam specific gravity of the first component (f1) to the foam specific gravity of the second component (f2), that is  $f2/f1$ , is in the range of 1.1 - 3. The ratio of the foam specific gravities, i.e.  $f2/f1$ , is more preferably in the range of 1.3 - 2.8.

[0075]

(3) Further specific examples of the constitution of the oxidative hair dye composition include an aerosol-type foamy oxidative hair dye composition, which comprises a first component containing an alkali agent selected from ammonia or an ammonium salt and a second component containing an oxidizing agent, in which both components are discharged at the time of application in foamy states and mixed, and which further comprises water, a surfactant, a propellant and a higher alcohol, and in which the ratio of the foam specific gravity of the first component (f1) to the foam specific gravity of the second component (f2), i.e.  $f2/f1$ , at the time of discharge of the oxidative hair dye composition is in the range of 1.1 - 3. The ratio of the foam specific gravities, i.e.  $f2/f1$ , is more preferably in the range of 1.3 - 2.8.

[0076]

(4) In the above-described examples of the constitution (3), it is particularly preferable that the first component and the second component contain a higher alcohol, in which the ratio of the content of the higher alcohol in the first component (a1) to the content of the higher alcohol in the second component (a2), that is  $a2/a1$ , is in the range of 0.5 - 2.0.

[0077]

(5) Further, in the above-described examples of the constitution (3), preferable examples of a surfactant include a nonionic surfactant, in particular, a nonionic surfactant which is a polyoxyethylene (hereinafter, referred to as "POE") alkylether in which the number of carbon atoms of the alkyl group is 14 or less (p14). In addition, it is more preferable that the composition of the above-described examples of the constitution (3) further contains a nonionic surfactant which is a POE alkylether in which the number of carbon atoms of the alkyl group is 16 or more (p16), in addition to the above-described nonionic surfactant. Further, the content of the nonionic surfactant in the first component relative to the content of the nonionic surfactant in the second component is preferably 1.1-fold or more, and more preferably 1.5-fold - 4-fold.

[0078]

(6) Furthermore, in the above-described examples of the constitution (3), it is preferable that the composition of the above-described examples of the constitution (3) contains, as a

surfactant, a cationic surfactant, in particular, a cationic surfactant which is an alkyltrimethylammonium in which the number of carbon atoms of the alkyl group is 12 or more, in addition to the nonionic surfactant.

[0079]

{Embodiments of the aerosol-type foamy oxidative hair dye composition according to the second group of aspects of the invention}

The aerosol-type foamy oxidative hair dye composition comprises, as its constituents, a component a which is an emulsified material containing a higher alcohol with C16 or more, and a component b which is an emulsified material containing a higher alcohol with C14 or less. Both the component a and the component b may be arbitrary components of the multi-component type oxidative hair dye such as the first component, the second component, the third component and the like, but preferably, each of the component a and the component b corresponds to either "the first component containing the alkali agent" or "the second component containing the oxidizing agent."

[0080]

It is also preferable that the component b further contains a higher alcohol with C16 or more. In this case, the mass ratio of the content of the higher alcohol with C16 or more in the component b, i.e. C(16), to the content of the higher alcohol with C14 or less in the component b, i.e. C(14), that is  $C(16)/C(14)$ , is preferably 3 - 20. In addition, it is preferable that the mass ratio of the

content of the surfactant in the component b to the content of the higher alcohol in the component b, i.e. the surfactant/the higher alcohol, is 1 or less.

[0081]

{Embodiments of the aerosol-type foamy oxidative hair dye composition according to the third group of aspects of the invention}

The aerosol-type foamy oxidative hair dye composition is composed of multiple components, and at least one component in the multiple components satisfies the condition of the following (A). A component which satisfies the condition of (A) is hereinafter also referred to as a component (A). The component (A) is preferably the first component containing the alkali agent. Two or more components in the multi-component type oxidative hair dye composition may be components (A), and in such a case, it is more preferable that the first component and the second component are components (A).

[0082]

(A) An emulsified material which contains a nonionic surfactant, a higher alcohol with C20 or more, and a higher alcohol with C18 or less, in which the mass ratio of the nonionic surfactant to the higher alcohol, i.e. the nonionic surfactant/the higher alcohol, is 1.5 - 50.

[0083]

It is preferable that the component (A) has a viscosity of 2,000 mPa·s or less. A method for measuring the viscosity of the component (A) is not particularly limited, but the above-described viscosity value of "2,000 mPa·s or less" is determined based on the viscosity value measured by using a B-type viscometer and a rotor No.2 at 25° C for one minute under the measuring condition of 12 rpm/min. Specific examples of the B-type viscometer include, for example, BL-viscometer, VISCOMETER (manufactured by TOKI SANGYO CO., LTD).

[0084]

In addition, it is preferable that the component (A) contains a higher alcohol, and that the mass ratio of the content of the higher alcohol with C20 or more to the content of the total higher alcohols is 0.005 - 0.9.

[0085]

{Essential or major ingredients of the aerosol-type foamy oxidative hair dye composition according to the present invention}

In general, an alkali agent and a dye component are essential ingredients of the first component of the oxidative hair dye composition, and an oxidizing agent is an essential ingredient of the second component of the oxidative hair dye composition. In addition, water is a substantially essential ingredient in each component of the oxidative hair dye composition.

[0086]

(An alkali agent)

The first component of the oxidative hair dye contains an alkali agent. The content of the alkali agent in the first component is not particularly limited, but is preferably in the range of 0.5 - 20 mass%. The pH of the first component containing the alkali agent is preferably 8 - 12. In the first group of aspects of the invention, the first component contains at least one alkali agent selected from ammonia and an ammonium salt, but the first component may further contain the following alkali agents other than them together.

[0087]

Examples of the alkali agent include ammonia, an ammonium salt, an alkanolamine, organic amines (2-amino-2-methyl-1,3-propanediol, guanidine and the like), an inorganic alkali (sodium hydroxide, potassium hydroxide and the like), a carbonate (sodium carbonate, potassium carbonate, ammonium carbonate, ammonium bicarbonate and the like), a basic amino acid (arginine, lysine and the like) and salts thereof and the like. Specific examples of the alkanolamine include, monoethanolamine, diethanolamine, triethanolamine, monopropanolamine, isopropanolamine, dipropanolamine, tripropanolamine, 2-amino-2-methyl-1,3-propanediol, 2-amino-2-methyl-1-propanol, 2-amino-2-hydroxymethyl-1,3-propanediol and the like. One kind or two or more kinds of them may be used.

[0088]

Preferable examples of the ammonium salt contained in the first component according to the first group of aspects of the invention include an ammonium salt of an inorganic acid such as ammonium carbonate, ammonium bicarbonate, ammonium bicarbonate, ammonium sulfate, ammonium phosphate, ammonium nitrate and the like, as well as an ammonium salt of an organic acid such as ammonium citrate, ammonium acetate, ammonium oxalate, ammonium tartrate and the like.

[0089]

(A dye component)

The first component of the oxidative hair dye contains a dye component. The content of the dye component in the first component can be appropriately set. The dye component is composed of an oxidation dye and/or a direct dye, and the oxidation dye is composed of an oxidation dye intermediate, or of an oxidation dye intermediate and a coupler. The dye component may further contain a melanin precursor and the like.

[0090]

The oxidation dye is a compound which can develop a color by oxidative polymerization due to the oxidizing agent. More specific examples of the oxidation dye include a phenylenediamine and its derivative, a phenolic derivative, an aminophenol and its derivative, a diphenylamine and its derivative, a pyridine derivative, a pyrimidine derivative, a pyrazole derivative, a pyrrolidine

derivative, a toluene derivative, an indole derivative, a pyrrole derivative, an imidazole derivative and the like. The amount of the oxidation dye admixed is not limited, but is preferably 0.01 - 7 mass%.

[0091]

More specific examples of the oxidation dye intermediate include phenylenediamines (except for, meta-phenylenediamine), aminophenols (except for, meta-aminophenol, 2,4-diaminophenol and para-methylaminophenol), toluylene diamines (except for, toluene-3,4-diamine and toluene-2,4-diamine), diphenylamines, diaminophenylamines, N-phenylphenylenediamines, diaminopyridines (except for, 2,6-diaminopyridine) and the like.

[0092]

Examples of the coupler include resorcin, pyrogallol, catechol, meta-aminophenol, meta-phenylenediamine, 2,4-diaminophenol, 1,2,4-benzenetriol, toluene-3,4-diamine, toluene-2,4-diamine, hydroquinone,  $\alpha$ -naphthol, 2,6-diaminopyridine, 1,5-dihydroxynaphthalene, 5-aminoorthocresol, para-methylaminophenol, 2,4-diaminophenoxyethanol, gallic acid, tannic acid, ethyl gallate, methyl gallate, propyl gallate, Japanese gall, 5-(2-hydroxyethylamino)-2-methylphenol and the like.

[0093]

The above-described oxidation dye is a concept including salts of a compound which can develop a color by oxidative polymerization

due to the oxidizing agent. Examples of them include acid addition salts of the above-described compounds and the like. Preferable examples of them include an organic acid addition salt, an inorganic acid addition salt and the like.

[0094]

These oxidation dyes may be admixed alone or may be combined to be admixed.

[0095]

Examples of the direct dye include an acid dye, a basic dye, a natural dye, a nitro dye, a disperse dye and the like. These direct dyes may be admixed alone or may be combined to be admixed.

[0096]

Examples of the above-described acid dye include Red No. 2, Red No. 3, Red No. 102, Red No. 104-(1), Red No. 105-(1), Red No. 106, Red No. 227, Red No. 230-(1), Yellow No. 4, Yellow No. 5, Yellow No. 202-(1), Yellow No. 202-(2), Yellow No. 203, Orange No. 205, Orange No. 207, Orange No. 402, Green No. 3, Green No. 204, Green No. 401, Violet No. 401, Blue No. 1, Blue No. 2, Blue No. 202, Brown No. 201, Black No. 401 and the like.

[0097]

Examples of the above-described basic dye include Basic Blue 3, Basic Blue 6, Basic Blue 7, Basic Blue 9, Basic Blue 26, Basic Blue 41, Basic Blue 47, Basic Blue 99, Basic Brown 4, Basic Brown

16, Basic Brown 17, Basic Green 1, Basic Green 4, Basic Orange 1, Basic Orange 2, Basic Orange 31, Basic Red 1, Basic Red 2, Basic Red 22, Basic Red 46, Basic Red 51, Basic Red 76, Basic Red 118, Basic Violet 1, Basic Violet 3, Basic Violet 4, Basic Violet 10, Basic Violet 11:1, Basic Violet 14, Basic Violet 16, Basic Yellow 11, Basic Yellow 28, Basic Yellow 57, Basic Yellow 87 and the like.

[0098]

Examples of the above-described natural dye include a gardenia pigment, a turmeric pigment, an annatto pigment, a sodium copper chlorophyllin, a paprika pigment, a lac pigment and the like.

[0099]

Examples of the above-described nitro dye include 4-nitro-o-phenylenediamine, 2-nitro-p-phenylenediamine, 2-amino-4-nitrophenol, 2-amino-5-nitrophenol, picramic acid, picric acid and salts thereof, HC Blue No. 2, HC Blue No. 5, HC Blue No. 6, HC Blue No. 9, HC Blue No. 10, HC Blue No. 11, HC Blue No. 12, HC Blue No. 13, HC Orange No. 1, HC Orange No. 2, HC Orange No. 3, HC Red No. 1, HC Red No. 3, HC Red No. 7, HC Red No. 10, HC Red No. 11, HC Red No. 13, HC Red No. 14, HC Violet No. 1, HC Violet No. 2, HC Yellow No. 2, HC Yellow No. 4, HC Yellow No. 5, HC Yellow No. 6, HC Yellow No. 9, HC Yellow No. 10, HC Yellow No. 11, HC Yellow No. 12, HC Yellow No. 13, HC Yellow No. 14, HC Yellow No. 15 and the like.

[0100]

Examples of the above-described disperse dye include Disperse Black 9, Disperse Blue 1, Disperse Blue 3, Disperse Blue 7, Disperse Brown 4, Disperse Orange 3, Disperse Red 11, Disperse Red 15, Disperse Red 17, Disperse Violet 1, Disperse Violet 4, Disperse Violet 15 and the like.

[0101]

(An oxidizing agent)

The second component of the oxidative hair dye contains an oxidizing agent. Specific examples of the oxidizing agent include hydrogen peroxide, urea peroxide, melamine peroxide, sodium percarbonate, potassium percarbonate, sodium perborate, potassium perborate, sodium peroxide, potassium peroxide, magnesium peroxide, barium peroxide, calcium peroxide, strontium peroxide, a hydrogen peroxide adduct of a sulfate, a hydrogen peroxide adduct of a phosphate, a hydrogen peroxide adduct of a pyrophosphate and the like. These oxidizing agents may be admixed alone or two or more kinds of them may be combined to be admixed. Among these oxidizing agents, hydrogen peroxide is preferable because it has a strong bleaching power of melanins.

[0102]

The content of the oxidizing agent in the second component is not limited, but is preferably in the range of 0.1 - 15 mass%. In addition, the pH of the second component containing the oxidizing agent is preferably 1 - 5.

[0103]

(Water)

Water is a base material in which each of the ingredients other than those described above is dispersed in each of components constituting the oxidative hair dye composition, and at the same time, is required for making each component foamy. The content of water in each component is preferably in the range of 30 - 90 mass%.

[0104]

(A surfactant)

A surfactant contained in the oxidative hair dye according to the first group of aspects of the invention

Each component of the oxidative hair dye composition according to the first group of aspects of the invention preferably contains a surfactant. Examples of the surfactant include, a nonionic surfactant, a cationic surfactant, an anionic surfactant, and an amphoteric surfactant. It is particularly preferable that the oxidative hair dye composition contains a nonionic surfactant and a cationic surfactant, and it is preferable that the oxidative hair dye composition contains both a nonionic surfactant and an ionic surfactant.

[0105]

Preferable examples of the cationic surfactant include, but are not limited to, an alkyltrimethylammonium in which the number of carbon atoms of the alkyl group is 16 or less and a salt thereof

in terms of improvement of foamability. Specific examples of them include stearyl trimethylammonium, lauryltrimethylammonium, cetyltrimethylammonium, and salts thereof. In addition, the alkyl group with the number of carbon atoms of 16 or less in a cationic surfactant is preferably saturated, and is preferably straight-chain, and may be modified with a halogen atom and a hydroxyl group. The content of the cationic surfactant in the oxidative hair dye composition is not limited, but the content in the first component is preferably in the range of 0.01 - 6 mass%, and the content in the second component is preferably in the range of 0.01 - 6 mass%.

[0106]

Examples of the nonionic surfactant are not limited, but a POE alkylether in which the number of carbon atoms of the alkyl group is 14 or less is preferable in terms of the improvement of foamability, and specific examples of them include a POE lauryl ether such as POE (10) lauryl ether, POE (30) lauryl ether and the like, a POE myristyl ether, and the like. In addition, a POE alkylether in which the number of carbon atoms of the alkyl group is 16 or more is also preferable, and its specific examples include, a POE cetyl ether such as POE (10) cetyl ether, POE (30) cetyl ether and the like, a POE stearyl ether, a POE behenyl ether, and the like. The number of polymerization unit of the above-described polyoxyethylene is preferably in the range of 2 - 50. The alkyl group with the number of carbon atoms of 14 or less in the nonionic

surfactant is preferably saturated, and is preferably straight-chain.

[0107]

Examples of the anionic surfactant include an alkyl ether sulfate, an alkyl sulfate, an alkenyl ether sulfate, an alkenyl sulfate, an olefin sulfonate, an alkanesulfonate, an alkyl- or alkenyl-ether carboxylate, an  $\alpha$ -sulfone fatty acid salt, an N-acylamino acid type surfactant, a phosphoric acid monoester- or diester based surfactant and a sulfosuccinic acid ester. One type or two or more types of them may be used. Examples of counter ions of anion radicals of these surfactants include sodium ion, potassium ion and triethanolamine.

[0108]

Examples of the alkyl sulfate include sodium lauryl sulfate and sodium cetyl sulfate. Examples of the sulfosuccinic acid ester include disodium lauryl sulfosuccinate and polyoxyethylene lauryl sulfate.

[0109]

Examples of the amphoteric surfactant include a carbo betaine type amphoteric surfactant, an amido betaine type amphoteric surfactant, a sulfobetaine type amphoteric surfactant, a hydroxysulfobetaine type amphoteric surfactant, an amide sulfobetaine type amphoteric surfactant, a phosphobetaine type amphoteric surfactant, an imidazolinium type amphoteric surfactant,

an alkylbetaine type amphoteric surfactant, an alkylamide betaine type amphoteric surfactant, an amino acid based ampholytic surfactant type amphoteric surfactant and an amine oxide type amphoteric surfactant, and one type or two or more types of them may be used. An alkylbetaine type amphoteric surfactant, an amido betaine type amphoteric surfactant, an alkylamide betaine type amphoteric surfactant, and an imidazolinium type amphoteric surfactant are preferable.

[0110]

More specific examples of the amphoteric surfactant include alkyl carboxymethyl hydroxyethyl imidazolinium betaine, 2-alkyl-N-carboxymethyl-N-hydroxyethylimidazolinium betaine, lauryl dimethyl betaine, lauryl dimethylamino acetic acid betaine, sodium undecynoyl carboxymethoxyethyl carboxymethyl imidazolinium betaine, sodium undecyl hydroxyethyl imidazolinium betaine, undecyl N-hydroxyethyl-N-carboxymethyl imidazolinium betaine, alkyldiaminoethylglycine hydrochloride, stearyl dihydroxyethyl betaine, stearyl dimethyl aminoacetic acid betaine, sodium stearyl dimethyl betaine solution, bis(stearyl-N-hydroxyethyl imidazoline)chloroacetic acid complex, sodium coconut oil alkyl-N-carboxyethyl-N-hydroxyethyl imidazolinium betaine, coconut oil alkyl-N-carboxyethoxyethyl-N-carboxyethyl imidazolinium disodium hydroxide, coconut oil alkyl-N-carboxymethoxyethyl-N-carboxyethyl imidazolinium

disodium hydroxide, coconut oil  
alkyl-N-carboxymethoxyethyl-N-carboxyethyl imidazolinium  
disodium lauryl sulfuric acid, coconut oil alkyl betaine, coconut  
oil fatty acid amide propyl betaine, sodium coconut oil fatty  
acid-N-carboxymethoxyethyl-N-carboxyethyl imidazolinium betaine,  
lauryl aminopropionic acid triethanolamine, sodium  $\beta$ -lauryl  
aminopropionic acid, lauryl N-carboxymethoxyethyl-N-carboxymethyl  
imidazolinium disodium dodecanoyl sarcosine, sodium lauryl diamino  
ethylglycine, laurylic acid amidopropyl betaine, laurylic acid  
amidopropyl dimethyl aminoacetic acid and the like. Lauryl dimethyl  
betaine, coconut oil fatty acid amide propyl betaine, laurylic acid  
amidopropyl dimethyl aminoacetic acid, alkyl carboxymethyl  
hydroxyethyl imidazolinium betaine are preferable.

[0111]

The content of the nonionic surfactant in the oxidative hair  
dye composition is not limited, but the content in the first component  
is preferably in the range of 0.5 - 10 mass%, and the content in  
the second component is preferably in the range of 0.3 - 5 mass%.

[0112]

The total content of the surfactant in each component  
constituting the oxidative hair dye composition is not particularly  
limited, but the total content in the first component may be around  
0.5 - 10 mass%, and the total content in the second component may  
be around 0.3 - 5 mass%. When the total content of the surfactant

in the second component is larger than the total content of the surfactant in the first component, it is easy to make the foam specific gravity of the first component relatively small.

[0113]

Meanwhile, the anionic surfactant is preferable in terms of good foamability, and specific examples of the anionic surfactant include a sodium POE lauryl sulfate and the like. In addition, examples of the amphoteric surfactant include lauryl dimethylamino acetic acid betaine and the like.

[0114]

A surfactant contained in the oxidative hair dye according to the second group of aspects of the invention

It is preferable that each component of the oxidative hair dye composition according to the second group of aspects of the invention contains a surfactant. Examples of the surfactant include a nonionic surfactant, a cationic surfactant, an anionic surfactant, and an amphoteric surfactant. One kind or two or more kinds of them may be used. The same is true in specific examples described below. Among the above, the combination of a nonionic surfactant and an ionic surfactant is preferable in terms of the improvement of stability of viscosity, and the combination of a nonionic surfactant and a cationic surfactant is more preferable. Examples of the ionic surfactant include a cationic surfactant, an anionic surfactant, and an amphoteric surfactant.

[0115]

A cationic surfactant has a basic structure in which a hydrocarbon group that can have a substituent is attached to a nitrogen atom. The substituents may be combined together to form a ring structure. Normally, the nitrogen atom is quaternary. The quaternary nitrogen atom is cationic, and normally, a counter ion is present. Examples of the counter ion include chloride ion, bromide ion, iodide ion, alkyl sulfate ion and saccharin. The hydrocarbon group may be straight chain or may be branched type.

[0116]

Examples of the cationic surfactant include an alkyl trimethylammonium salt, an alkenyl trimethyl ammonium salt, a dialkyl dimethyl ammonium salt, a dialkenyl dimethyl ammonium salt, an alkyloyl amidopropyl dimethylamine, an alkyl pyridinium salt and a benzalkonium salt.

[0117]

Specific examples of the cationic surfactant include cetyltrimethylammonium chloride, stearyltrimethylammonium chloride, isostearyltrimethylammonium chloride, lauryl trimethylammonium chloride, behenyltrimethylammonium chloride, octadecyltrimethylammonium chloride, cocoil trimethylammonium chloride, cetyltrimethylammonium bromide, stearyl trimethylammonium bromide, lauryl trimethylammonium bromide, isostearyl lauryl dimethylammonium chloride, dicetyl

dimethylammonium chloride, distearyl dimethylammonium chloride, dicocoil dimethylammonium chloride,  $\gamma$ -gluconamide propyldimethylhydroxyethyl ammonium chloride, di(polyoxyethylene)oleylmethylammonium chloride, dodecyldimethylethylammonium chloride, octyldihydroxyethyl methylammonium chloride, tri(polyoxyethylene)stearyl ammonium chloride, polyoxypropylene methyldiethylammonium chloride, lauryl dimethyl(ethylbenzyl)ammonium chloride, behenic acid amidopropyl-N-N-dimethyl-N-(2,3-dihydroxypropyl) ammonium chloride, tallowdimethylammoniopropyltrimethyl ammonium dichloride and benzalkonium chloride.

[0118]

Examples of the particularly preferable cationic surfactant include those described in the above paragraph 0105.

[0119]

Preferable examples of the nonionic surfactant include, a POE alkylether in which the number of carbon atoms of the alkyl group is 14 or less and a POE alkylether in which the number of carbon atoms of the alkyl group is 16 or more, which are described in the above paragraph 0106. It is more preferable that the POE alkylether in which the number of carbon atoms of the alkyl group is 14 or less and the POE alkylether in which the number of carbon atoms of the alkyl group is 16 or more are used together. Examples of the POE alkylether in which the number of carbon atoms of the alkyl

group is 16 or more include a POE cetyl ether, a POE oleyl ether, a POE stearyl ether, a POE isostearyl ether and a POE behenyl ether. One kind or two or more kinds of them may be used. It is preferable that the number of polymerization unit of the polyoxyethylene is 2 - 50. It is also preferable that the alkyl group of which the number of carbon atoms is 16 or more is saturated and straight chain.

[0120]

When the above-described POE alkylether in which the number of carbon atoms of the alkyl group is 14 or less (the former) and the above-described POE alkylether in which the number of carbon atoms of the alkyl group is 16 or more (the latter) are used together, the mass ratio of their contents, which is "the former/the latter," is preferably 0.1 - 7. More preferably, the mass ratio, "the former/the latter," is 0.5 - 3. When the mass ratio is in these ranges, foamability tends to be improved.

[0121]

With regard to the anionic surfactant and the amphoteric surfactant, the same is true as already mentioned in the above paragraphs 0107 - 0110.

[0122]

The amount of the surfactant in each component constituting the aerosol-type foamy oxidative hair dye composition which comprises the first component and the second component is not particularly limited, but it is preferably 0.1 - 6 mass%, and more

preferably 0.5 - 5 mass%. Further, the amount of the surfactant in the mixture is preferably 0.1 - 6 mass%, and is more preferably 0.5 - 5 mass%.

[0123]

A surfactant contained in the oxidative hair dye according to the third group of aspects of the invention

The component (A) of the oxidative hair dye composition according to the third group of aspects of the invention contains, as an essential component, a nonionic surfactant. In addition, it is preferable that each component of the oxidative hair dye composition contains a surfactant other than the nonionic surfactant. Examples of the nonionic surfactant include a polyoxyalkylene adduct type nonionic surfactant, a sugar adduct type nonionic surfactant, a glycerin adduct type nonionic surfactant and an alkanolamide adduct type nonionic surfactant. One kind or two or more kinds of them may be used. The amount of the nonionic surfactant admixed is preferably 0.1 - 10 mass%, and is more preferably 0.5 - 5 mass%.

[0124]

Examples of the polyoxyalkylene adduct type nonionic surfactant include an ether type surfactant such as a polyoxyethylene alkylether, a polyoxyethylene alkenyl ether, a polyoxyethylene polyoxypropylene alkylether and the like, an ester type surfactant such as a polyoxyethylene fatty acid ester, and the like. Examples of the sugar adduct type nonionic surfactant include sugar ethers

such as an alkyl polyglucoside and the like, sugar esters such as a sucrose fatty acid ester, a sorbitan fatty acid ester and the like, sugar amides such as a fatty acid glycol amide and the like. Examples of the glycerin adduct type nonionic surfactant include an alkyl glyceryl ether, a glycerin fatty acid ester and the like. Examples of the alkanolamide type nonionic surfactant include a fatty acid monoalkanolamide, a fatty acid diethanolamide and the like.

[0125]

Specific examples of the ether type nonionic surfactant include a POE cetyl ether, a POE stearyl ether, a POE behenyl ether, a POE oleyl ether, a POE lauryl ether, a POE myristyl ether, a POE octyldodecyl ether, a POE hexyldecyl ether, a POE isostearyl ether, a POE nonylphenyl ether, a POE octylphenyl ether, a POE polyoxypropylene (hereinafter, also referred to as POP) cetyl ether, and the like.

[0126]

Specific examples of the ester type nonionic surfactant include a POE sorbitan monooleate, a POE sorbitan monostearate, a POE sorbitan monopalmitate, a POE sorbitan monolaurate, a POE sorbitan trioleate, a glyceryl POE monostearate, a POE glyceryl monomyristate, a POE sorbitan tetraoleate, a POE sorbitan hexastearate, a POE sorbitan monolaurate, a POE sorbitan beeswax, a polyethylene glycol monooleate, a polyethylene glycol monostearate, a polyethylene

glycol monolaurate, a lipophilic type glyceryl monooleate, a lipophilic type glyceryl monostearate, a self-emulsifying type glyceryl monostearate, a sorbitan monooleate, a sorbitan sesquioleate, a sorbitan trioleate, a sorbitan monostearate, a sorbitan monopalmitate, a sorbitan monolaurate, a sucrose fatty acidester, a decaglyceryl monolaurate, a decaglyceryl monostearate, a decaglyceryl monooleate, a decaglyceryl monomyristate, and the like.

[0127]

When the nonionic surfactant contains polyoxyethylene, the number of polymerization unit of the polyoxyethylene is preferably 2 - 50.

[0128]

Preferable examples of the nonionic surfactant include the POE alkylether, in which the number of carbon atoms of the alkyl group is 14 or less (the former), and the POE alkylether, in which the number of carbon atoms of the alkyl group is 16 or more (the latter), as described in the above paragraph 0106, in terms of the improvement of foamability, and combined use of the former and the latter is particularly preferable. In the case of the combined use of them, the mass ratio of their contents is as described in the above paragraph 0120.

[0129]

The component (A) may contain an alkyltrimethylammonium in which the number of carbon atoms of the alkyl group is 16 or less, which is a cationic surfactant, and a salt thereof in terms of the improvement of foamability. Specific examples of them include lauryltrimethylammonium, cetyltrimethylammonium and salts thereof. One kind or two or more kinds of them may be used. Further, the alkyl group with the number of carbon atoms of C16 or less in the cationic surfactant is preferably saturated, and preferably straight chain. The amount of the alkyltrimethylammonium in which the number of carbon atoms of the alkyl group is 16 or less and its salt is preferably 0.01 - 5 mass%, and is more preferably 0.05 - 3 mass%.

[0130]

(A higher alcohol)

In the present invention, the term "a higher alcohol" refers to a monovalent alcohol of C6 or more. Examples of the higher alcohol include a straight chain higher alcohol and a branched type higher alcohol and, preferably, the higher alcohol is a straight chain higher alcohol. In addition, examples of the higher alcohol include a saturated higher alcohol and an unsaturated higher alcohol and, preferably, the higher alcohol is a saturated higher alcohol.

[0131]

A higher alcohol contained in the oxidative hair dye according to the first group of aspects of the invention

It is preferable that the oxidative hair dye composition according to the first group of aspects of the invention contains a higher alcohol in terms of the improvement of hair-dyeing properties and of the improvement of the quality of foams, and it is particularly preferable that the oxidative hair dye composition according to the first group of aspects of the invention contains both a higher alcohol with C16 or more and a higher alcohol with C14 or less.

[0132]

Examples of the higher alcohol with C16 or more include cetyl alcohol (cetanol), 2-hexyldecanol, cetyl/stearyl alcohol, stearyl alcohol, isostearyl alcohol, oleyl alcohol, arachyl alcohol, 2-octyl dodecanol, behenyl alcohol, decyltetradecanol, lanolin alcohol and the like. Among the above, a higher alcohol which is solid at 25°C and 1 atm is preferable, and cetanol, stearyl alcohol, cetyl/stearyl alcohol, arachyl alcohol, behenyl alcohol and the like are more preferable.

[0133]

The amounts of the higher alcohol with C16 or more contained in the first component and the second component are not limited, but both are preferably in the range of 0.1 - 7 mass% and are, in particularly preferably, in the range of 0.2 - 4 mass%.

[0134]

Examples of the higher alcohol with C14 or less include lauryl alcohol, myristyl alcohol, capryl alcohol, and the like. More preferable examples include myristyl alcohol.

[0135]

The amount of the higher alcohol with C14 or less contained in the first component is not limited, but is preferably in the range of 0.1 – 5 mass%, and is particularly preferably in the range of 0.2 – 4 mass%. The amount of the higher alcohol with 14 or less contained in the second component is not limited, but is preferably in the range of 0.1 – 5 mass%, and is particularly preferably in the range of 0.2 – 4 mass%.

[0136]

In the case when both the higher alcohol with C16 or more and the higher alcohol with C14 or less are contained together in the first component or the second component, the mass ratio of the content of the higher alcohol with C16 or more ( $a_{16}$ ) to the content of the higher alcohol with C14 or less ( $a_{14}$ ), which is  $a_{16}/a_{14}$ , is preferably in the range of 0.1 – 150, and is particularly preferably in the range of 1 – 20 in terms of the improvement of the glutinous quality of foams and of the improvement of the hair-dyeing properties and the like.

[0137]

In addition, with regard to each of the above-described higher alcohols contained in the first component and the second component

respectively, the ratio of the content of the higher alcohol in the first component (a1) to the content of the higher alcohol in the second component (a2), which is  $a2/a1$ , is preferably in the range of 0.5 - 2.0, and is more preferably in the range of 0.8 - 1.7.

[0138]

A higher alcohol contained in the oxidative hair dye according to the second group of aspects of the invention

It is preferable that the oxidative hair dye composition according to the second group of aspects of the invention contains a higher alcohol, and it is particularly preferable that the oxidative hair dye composition according to the second group of aspects of the invention contains a higher alcohol with C16 or more and a higher alcohol with C14 or less. Specific examples of the higher alcohol with C16 or more are as described in the above paragraph 0132 and specific examples of the higher alcohol with C14 or less are as described in the above paragraph 0134.

[0139]

The amounts of the higher alcohol with C16 or more contained in the component a and the component b are as described in the above paragraph 0133 which mentions the first component and the second component. The amount of the higher alcohol with C14 or less contained in the component b is not limited, but is preferably 0.01 - 2.5 mass%, and is more preferably 0.05 - 2 mass%. The higher alcohol

with C14 or less may be or may not be contained in the component a, but when the higher alcohol with C14 or less is contained in the component a, the amount is preferably 0.01 - 1.5 mass%, and is more preferably 0.05 - 1.5 mass%.

[0140]

The amount of the higher alcohol with C14 or less contained in the mixture of the component a and the component b is not limited, but is preferably 0.01 - 2 mass%, and is more preferably 0.05 - 1.75 mass%.

[0141]

In the case when the component b contains both a higher alcohol with C16 or more and a higher alcohol with C14 or less, the mass ratio of these higher alcohols, which is "the higher alcohol with C16 or more/the higher alcohol with C14 or less", is preferably 3 - 20. More preferably, the mass ratio is 3.5 - 18, and further preferably is 5 - 16. By making the mass ratio be within the above ranges, there tends to be the advantage of good balance of the strong hair dyeing power and the good quality of foams.

[0142]

When two or more components constituting the aerosol-type foamy oxidative hair dye composition contain the higher alcohol with C16 or more and the higher alcohol with C14 or less, one of these components corresponds to the above-described component a or the above-described component b.

[0143]

In the oxidative hair dye composition according to the second group of aspects of the invention, it is preferable that the component b contains a surfactant and that the mass ratio of the surfactant to the higher alcohol contained in the component b, which is "the surfactant/the higher alcohol," is 1 or less, in terms of the improvement of the hair dyeing power and the improvement of the quality of foams in a well balanced manner. The mass ratio is preferably 0.1 - 0.9, and is more preferably 0.4 - 0.9. Since the component b contains both the surfactant and the higher alcohol, the value of the mass ratio is not zero.

[0144]

With regard to the above-described ratio of "the surfactant/the higher alcohol," it is preferable that a cationic surfactant and a nonionic surfactant are contained as the surfactant, and it is more preferable that a nonionic surfactant is contained as the surfactant. In addition, it is preferable that the higher alcohol is a straight chain higher alcohol.

[0145]

A higher alcohol contained in the oxidative hair dye according to the third group of aspects of the invention

The component (A) of the oxidative hair dye composition according to the third group of aspects of the invention contains

a higher alcohol and, in particular, the component (A) contains a higher alcohol with C20 or more and a higher alcohol with C18 or less as essential components. Each component other than the component (A) may contain a higher alcohol. The amount of the higher alcohol contained in the component (A) is preferably 0.5 mass% or more, and is more preferably 0.5-5 mass%, and is still more preferably 0.5 - 3 mass%. When the amount of the higher alcohol contained in the component (A) is in these preferable ranges, advantages of the improvement of the hair dyeing power and of the improvement of the quality of foams can be achieved.

[0146]

Examples of the higher alcohol with C20 or more include arachyl alcohol, behenyl alcohol and decyltetradecanol. Preferable examples are arachyl alcohol and behenyl alcohol. Examples of the higher alcohol with C18 or less include lauryl alcohol, myristyl alcohol, cetanol, 2-hexyldecanol, cetyl/stearyl alcohol, stearyl alcohol, isostearyl alcohol and oleyl alcohol. Preferable examples are myristyl alcohol, cetanol, stearyl alcohol and cetyl/stearyl alcohol.

[0147]

The amount of the higher alcohol with C20 or more contained in the component (A) is preferably 0.1-3 mass%, and is more preferably 0.1 - 1.5 mass%. The amount of the higher alcohol with C18 or less

contained in the component (A) is preferably 0.1 - 3 mass%, and is more preferably 0.1 - 1.5 mass%.

[0148]

The mass ratio of the higher alcohol with C20 or more to the total higher alcohols in the component (A), which is "the higher alcohol with C20 or more/the total higher alcohols," is preferably 0.005 - 0.9, more preferably 0.01 - 0.9. The mass ratio is still more preferably 0.1 - 0.8. The phrase "the total higher alcohols" also includes the amount of the higher alcohol with C20 or more. When the ratio of the amount of the higher alcohol contained in the component (A) is within these preferable ranges, the stability of the emulsified material, the hair dyeing power and the quality of foams are excellent in a well-balanced manner.

[0149]

In the oxidative hair dye composition according to the third group of aspects of the invention, the mass ratio of the nonionic surfactant to the higher alcohol contained in the component (A), which is "the nonionic surfactant/the higher alcohol," is 1.5 - 50. When the mass ratio is less than 1.5, the stability of the emulsified material and the quality of foams tend to be insufficient. On the other hand, when the mass ratio exceeds 50, the hair dyeing power and the quality of foams tend to be insufficient. The mass ratio is preferably 1.5 - 40, and is more preferably 1.5 - 30, and is still more preferably 2 - 10. When the mass ratio is within these

preferable ranges, the hair dyeing power, the emulsification stability and the quality of foams are improved in a well-balanced manner, which is an advantage.

[0150]

With regard to the mass ratio of the above-described nonionic surfactant to the above-described higher alcohol, the nonionic surfactant is preferably the ether type nonionic surfactant and the higher alcohol is preferably the straight chain higher alcohol.

[0151]

(A solvent)

Each of the components constituting the oxidative hair dye composition according to the present invention may contain a solvent. The content of the solvent is preferably 10 mass% or less, and is more preferably 0.01 - 8 mass%, in terms of the improvement of the hair-dyeing properties, and of easy emulsification of each component.

[0152]

Examples of the solvent include a monovalent lower alcohol with the number of carbon atoms of 5 or less, such as ethanol, n-propanol, isopropanol and the like, polyols, and lower alkylethers thereof. Examples of the polyols include glyceryl, propylene glycol, dipropylene glycol, 1,3-butylene glycol, ethylene glycol, diethylene glycol, polyethylene glycol (PEG), isoprene glycol, sorbitol and the like. The lower alkylethers of the polyols include

mono lower alkylethers and poly lower alkylethers (for example, di lower alkylethers) of the above-described polyols and the like.

[0153]

{Other ingredients in the oxidative hair dye composition}

Each of the components constituting the oxidative hair dye composition according to the present invention may optionally contain, in addition to the above-described ingredients, for example, a fatty acid, a thickener, amino acids, a water soluble polymer such as hydroxyethyl cellulose and the like, a hydrocarbon including oils and fats, waxes, silicones and a liquid paraffin, sugars such as sorbitol, maltose and the like, a preservative such as a paraben, sodium benzoate and the like, a chelating agent such as EDTA-2Na, diethylenetriamine pentaacetic acid, hydroxyethane diphosphonic acid and its salt and the like, a stabilizing agent such as phenoxyethanol, phenacetin, 8-hydroxyquinoline, acetanilide, sodium pyrophosphate, barbituric acid, uric acid, tannic acid and the like, an antioxidant such as sodium sulfite and the like, a pH adjuster, a plant extract or a herbal medicine extract, vitamins including ascorbic acids, a fragrance, and the like. In addition, for example, at least one type of the ingredients selected from those listed in "Japanese Standards of Quasi-drug Ingredients 2006" (YAKUJI NIPPO LIMITED.) may be admixed.

[0154]

{Other embodiments of the oxidative hair dye composition}

(Viscosity)

The viscosity of each of components constituting the oxidative hair dye according to the present invention is not particularly limited and may be appropriately determined, but the viscosity is preferably 1 - 2,000 mPa·s, and is more preferably 50 - 1,000 mPa·s. By setting the viscosity within the above-described ranges, there is the advantage of the improvement of the operability upon application. The viscosity can be determined by using a B-type viscometer and a rotor No.2 at 25° C for one minute under the measurement condition of 12 rpm/min. Specific examples of the B-type viscometer include a BL-viscometer, VISCOMETER (manufactured by TOKI SANGYO CO., LTD).

[0155]

(The mixing ratio of each of the components)

The mixing ratio of each of the components constituting the oxidative hair dye according to the present invention is not particularly limited, and may be appropriately determined. In the oxidative hair dye according to the first group of aspects of the invention or the third group of aspects of the invention, the mixing ratio of the first component to the second component, which is the first component : the second component, is preferably in the range of 1 : 5 - 5 : 1, and the pH of the mixture is preferably 7 - 12. These are also true for the component a and the component b of the

oxidative hair dye according to the second group of aspects of the invention.

[0156]

(A propellant)

For the aerosol-type foamy oxidative hair dye composition disclosed in the present application, a well-known propellant can be employed. Examples of the propellant include a liquified gas such as LPG, dimethyl ether and the like, and a compressed gas such as carbon dioxide gas, nitrogen gas, and the like. Among the above, a liquified gas is preferable. One kind or two or more kinds of them may be used. The mass ratio of the each component constituting the aerosol-type foamy oxidative hair dye composition accommodated in an aerosol container to the propellant is preferably 90 : 10 - 98 : 2.

[0157]

The component a and the component b in the oxidative hair dye according to the second group of aspects of the invention are emulsified materials, and the component (A) in the oxidative hair dye according to the third group of aspects of the invention is also an emulsified material, but considering the manufacturing process, they are emulsified materials both in a stage in which they are raw liquids which do not contain a propellant and in a stage in which a propellant has been filled into them. In other words, when a material is an emulsified material after a propellant

is filled into it, it can be reasonably deduced that the raw liquid which corresponds to the above-described first component or the second component was also an emulsified material.

[0158]

{An aerosol container}

As an aerosol container, any of various known aerosol containers may be employed, and such a container may be of a type which accommodates each component of the oxidative hair dye composition separately and which discharges each of the foamy components together from a single discharge opening of a head portion, or may be of a type which discharges each of the foamy components separately from a plurality of discharge openings of a head portion.

[0159]

Among such types of aerosol containers which discharge components, an aerosol container in which the first component containing an alkali agent selected from ammonia or an ammonium salt is discharged in a foamy state from a discharge opening located relatively low, and in which the second component is discharged in a foamy state from a discharge opening located relatively high in a manner such that the second component hangs over the first component is particularly preferable. A more preferable aerosol container is set in a manner in which the second component is discharged from a discharge opening in a foamy state such that the second component covers the peripheral part of the first component.

[0160]

One standard example of the aerosol container is the aerosol container disclosed in JP 2002-284655 A. The aerosol container includes two cans in its body part, one which is filled with the first component and a propellant and the other which is filled with the second component and a propellant in a certain mass ratio, respectively. Stems extending from each of the cans are communicated with a mixing passage at a head portion through a communication hole, respectively, and this mixing passage is communicated with a discharge portion which is conducted to the outside only when a discharge lever is pushed. Accordingly, when the discharge lever is pushed, the first component and the second component are made foamy and reach the mixing passage to be mixed, and then the components are discharged from a discharge opening of the discharge portion.

[0161]

Another example of the aerosol container is the aerosol container disclosed in JP 2005-231644 A. The aerosol container is suited for a two-component type oxidative hair dye composition, and one can of the aerosol container accommodates two accommodation pouches for raw liquids, and a part connecting these pouches, and the aerosol container discharges the mixture of the first component and the second component in a foamy state.

[0162]

In addition, for example, an aerosol container of which one can accommodate two pouches and a connecting part, and which discharges a mixture in a foamy state, may be employed. Further, an aerosol container having an inner package, which accommodates each of the components and a propellant (for foaming) inside the inner package, and which accommodates a propellant (for extrusion) outside of the inner package, may be employed.

[0163]

A material and an internal pressure of an aerosol container may be appropriately determined depending on the types of the alkali agent, the oxidizing agent and the propellant, as well as in the way of accommodating each of the components.

[0164]

The present invention discloses an aerosol-type foamy oxidative hair dye composition as well as a product which includes a propellant and an aerosol container as its constituents, as described above.

## Examples

[0165]

Examples and Comparative Examples of the present invention are described hereinafter. The technical scope of the present invention is not limited to these Examples and Comparative Examples.

In Examples and Comparative Examples which are described hereinafter and which are shown in each of the Tables, the unit of numerical values representing the amount of each of the ingredients in the first component and the second component is "mass%" in a raw liquid of the first component or the second component. The phrase "Residual quantity" described in the item of "Purified water" with regard to the first component and the second component is so-called Quantum Sufficit, and means a numerical value calculated by the equation "100-X" (mass%), wherein X (mass%) refers to the total content of all ingredients other than purified water contained in a raw liquid.

[0166]

{Examples of the first group of aspects of the invention}

Hereinafter, Examples of the first group of aspects of the invention are referred to as "Examples of the first group" and Comparative Examples of the first group of aspects of the invention are referred to as "Comparative Examples of the first group".

#### The first group of Examples

(Preparation of oxidative hair dye compositions)

Two-component type oxidative hair dye compositions (raw liquids) according to Example 1 of the first group - Example 38 of the first group and Comparative Example 1 of the first group - Comparative Example 2 of the first group, each of which was composed of a first component and a second component whose compositions are

shown as "First component" and "Second component" respectively in Table 1 - Table 5 hereinafter, were prepared according to a routine procedure. With regard to the description of ingredients of the first component and the second component, for example, as described as "Cetanol (16)," a numerical value shown between a pair of brackets immediately after a name of an ingredient of a higher alcohol refers to the number of carbon atoms of the higher alcohol.

[0167]

Meanwhile, in Table 1 - Table 5, in the item "Second component OH/First component OH" in the section "Second component," the mass ratio of the content of a higher alcohol in a second component (Second component OH, in other words, the above-described a2) to the content of a higher alcohol in a first component (First component OH, in other words, the above-described a1) is shown with respect to each of the Examples and Comparative Examples of the first group.

[0168]

(Preparation of aerosol-type foamy oxidative hair dye compositions)

Next, each of the first component and the second component of a two-component type oxidative hair dye composition (a raw liquid) according to each of Example 1 of the first group - Example 38 of the first group, as well as of Comparative Example 1 of the first group - Comparative Example 2 of the first group, were filled in a commercially available aerosol-type discharge container (the aerosol container disclosed in JP 2002-284655 A) and a propellant

(LPG) was added thereto such that the weight was 50 g, and the first component and the second component of the aerosol-type foamy oxidative hair dye composition were discharged in foamy states by using a propellant (LPG) which was prepared separately in the container.

[0169]

As the above-described aerosol-type discharge container, a container of the type in which the first component and the second component were accommodated in separate cans respectively, and each of the foamy first component and the foamy second component was discharged by an action of a propellant separately from two discharge openings provided in a head portion, and in which the amount of the propellant used for making the first component and the second component foamy could be appropriately adjusted was used. The aerosol-type discharge container was a can-type container which had a diameter of 2.7 cm and the length from the upper surface to the bottom (the length of the stem not being included) of 15 cm. The mass ratio of a raw liquid to a propellant in a first component or a second component according to each of Examples and Comparative Examples of the first group is shown in the item of "Ratio of raw liquid to propellant" in the sections of "First component" and "Second component" in each of Tables.

[0170]

Incidentally, as shown in Table 1 - Table 5, the mass ratio of a raw liquid to a propellant in each of the first component and the second component according to each of Examples and Comparative Examples of the first group is basically unified as "95 : 5," but in the first component according to each Examples 35 and 36 of the first group shown in Table 5 and in the second component according to each Examples 37 and 38 of the first group, the mass ratio was somewhat different. In spite of this difference, there were no substantial differences between the foam specific gravity of each of these foamy first components and of these foamy second components and the foam specific gravity of each of foamy first components and of foamy second components of other Examples of the first group as described below. Accordingly, it can be understood that the mass ratio of a raw liquid to a propellant in each of the first component and the second component does not affect the foam specific gravity of each of the foamy first component and the foamy second component to great extent.

[0171]

(Measurement of a foam specific gravity)

About 15 g of each of a foamy first component and a foamy second component according to each of the Examples and Comparative Examples of the first group was discharged by making a broad estimate, and thereafter, a level cupful of it was put into a cylindrical type measuring cup with a volume of 30 ml and with a known weight (A

gram), excessive foam was discarded, and then the weight of the measuring cup in this state (B gram) was precisely measured, and the foam specific gravity of the foamy first component (f1) and the foam specific gravity of the foamy second component (f2) were calculated based on an equation of  $(B-A)/30$  by using values of "(B-A) gram" and "30 ml." The measured foam specific gravity of the first component (f1) is shown after the item of "Specific gravity of First component" in Tables, and the measured foam specific gravity of the second component (f2) is shown after the item of "Specific gravity of Second component" in Tables. The unit of the foam specific gravity is g/ml. Meanwhile, an aerosol-type foamy oxidative hair dye composition used for the measurement was from the day after the components were filled, and the composition was sufficiently shaken and the composition used was that of which components were discharged for the first time after being filled.

[0172]

(Evaluation of odor)

In a similar manner to the above-described "Measurement of a foam specific gravity," with regard to a first component and a second component discharged in foamy states according to each of the Examples and Comparative Examples of the first group, the evaluation of odor was conducted. In other words, the foamy first component and the foamy second component were shaken and mixed immediately after being discharged, simulating the normal use of

a hair dyeing, while 10 panelers conducted a sensory evaluation determining whether the irritating odor of ammonia was present or not.

[0173]

As an evaluation criteria, the irritating odor of ammonia was ranked as follows: rank "5" was "do not feel the irritating odor of ammonia"; rank "4" was "feel the irritating odor of ammonia to a degree almost incapable of feeling the presence of the odor"; rank "3" was "feel the irritating odor of ammonia to a small degree"; rank "2" was "feel the somewhat strong irritating odor of ammonia"; and rank "1" was "feel the strong irritating odor of ammonia."

[0174]

The average of ranks of evaluation thus obtained by 10 panelers was calculated with regard to each evaluation object, and when the average had numerical figures after a decimal point, the average was round to the nearest whole number to determine an evaluation rank. The results are shown after the item of "Odor" in a lower part in Table 1 - Table 5.

[0175]

(Evaluation of mixability)

An approximate amount of Yellow No. 203 was added in advance to a raw liquid of a first component according to each of the Examples and Comparative Examples of the first group to color the first component, and by using the first component together with a second

component which had been normally prepared, an aerosol-type foamy oxidative hair dye composition was made as described above, and the first component and the second component were discharged in foamy states. Then, the foamy first component and the foamy second component were shaken and mixed by the hands of 10 panelers to simulate the normal use of a hair dye while mixability was evaluated. A manual for shaking and mixing by hands, which strictly defined the operation manner, the operation speed and the operation times, was made and each of the panelers was made comply with it. Then, the mixability was evaluated by a criteria based on whether the part of foam of the colored first component and the part of foam of the uncolored second component were uniformly mixed in such a manner that they were not able to be distinguished or not.

[0176]

Specifically, the mixability of the part of the foams of the first component and the part of the foams of the second component was ranked as follows: rank "5" was "completely undistinguishable"; rank "4" was "almost undistinguishable"; rank "3" was "a little distinguishable"; rank "2" was "somewhat clearly distinguishable"; and rank "1" was "clearly distinguishable."

[0177]

The average of ranks of evaluation thus obtained by 10 panelers was calculated with regard to each evaluation object, and when the average had numerical figures after a decimal point, the average

was round to the nearest whole number to determine an evaluation rank. The results are shown after the item of "Mixability" in a lower part in Table 1 - Table 5.

[0178]

(Evaluation of hair dyeing power)

About 1.5 g of each of a foamy first component and a foamy second component according to each of the Examples and Comparative Examples of the first group was discharged from an aerosol-type discharge container as described above, and the foamy first component and the foamy second component were shaken and mixed to simulate normal use, and thereafter, the mixture was applied on each 1 g sample of a white-colored lock of hair with a length of 10 cm by hand, and the sample hair locks was left in a thermostatic chamber (30° C) for 30 minutes, and then the sample hair locks were washed with water. Thereafter, the sample hair locks were each treated with shampoo and rinse (conditioner) once respectively, and then the sample was dried with warm air.

[0179]

The above-described hair sample tests were observed by 10 panelers visually and a sensory evaluation determining whether the hair dyeing power was good or not was conducted. Specifically, comparing with the hair dyeing power of a normal foamy oxidative hair dye, the hair dyeing power was ranked as follows: rank "5" was "excellent hair dyeing power"; rank "4" was "somewhat good hair

dyeing power"; rank "3" was "normal hair dyeing power"; rank "2" was "slightly inferior hair dyeing power"; and rank "1" was "inferior hair dyeing power." The average of ranks of evaluation thus obtained by 10 panelers was calculated with regard to each evaluation object, and when the average had numerical figures after a decimal point, the average was round to the nearest whole number, to determine an evaluation rank. The results are shown after the item of "Hair dyeing power" in a lower part in Table 1 - Table 5.

[0180]

(Evaluation of operability)

With regard to the hair dyeing treatment conducted by using a foamy oxidative hair dye composition according to each of Examples and Comparative Examples of the first group, 10 panelers visually observed from the viewpoints of prevention of lump of foams from dropping, of prevention of foams from scattering, and of spreadability of foams, upon application operation, and the evaluation (sensory evaluation) determining whether the operability was good or not was conducted as comprehensive evaluation of the above-described 3 viewpoints. Though the evaluation results are not shown in Table 1 - Table 5, it was found that when the foam specific gravity was smaller (the size of foams was larger), the results tended to be better.

[0181]

### The second group of Examples

With regard to each Example 1 of the first group of Examples (Example 1 of the first group) in which the foam specific gravity of the foamy first component was made relatively lower (the size of foams was made relatively larger) than that of the foamy second component, and Comparative Example 3 (Comparative Example 3 of the first group) in which the foam specific gravity of the foamy first component was made higher (the size of foams was made relatively smaller) than the foam specific gravity of the foamy second component by decreasing the content of a nonionic surfactant in a composition of a raw liquid of the foamy first component of Comparative Example 3 to 0.5, that was higher than the foam specific gravity of the foamy first component of Example 34 of the first group, the foamy first component and the foamy second component were discharged from an aerosol-type discharge container and were shaken and mixed, and the foamy mixture containing them was subjected to the evaluation of "operability" which is described in the "finding" hereinabove.

[0182]

As a result, in the case of Example 1 of the first group, good operability, such as good spreadability upon application to the hair, being easy to be uniformly applied, and being difficult to slip down from the fingers and the hair, was found. However, in the case of Comparative Example 3 of the first group, the hair dye composition was difficult to be uniformly applied due to bad

spreadability upon application to the hair, and easily slipped down from the fingers and the hair.

[0183]

#### The third group of Examples

The oxidative hair dye of Example 28a of the first group was prepared by modifying the oxidative hair dye according to Example 28 of the first group of Examples (Example 28 of the first group) such that the content of cetanol in the first component was increased to 1.5 mass%, and the content of behenyl alcohol in the first component was increased to 0.6 mass%, respectively, to change the total content of a higher alcohol in the first component (a1) to 2.1 mass%, which made the ratio of the total content of a higher alcohol in the first component to the total content of a higher alcohol in the second component (a2), which was  $a2/a1$ , outside the range of 0.5 - 2.0.

[0184]

On the other hand, inversely to Example 28a of the first group, the oxidative hair dye of Example 28b of the first group was prepared by modifying the oxidative hair dye according to Example 28 of the first group of Examples (Example 28 of the first group) such that the content of cetanol in the second component was increased to 1.8 mass%, and the content of myristyl alcohol in the second component was increased to 0.3 mass%, respectively, to change the total content of a higher alcohol in the second component (a2) to 2.1 mass%, which made the ratio of the total content of a higher alcohol in the second

component to the total content of a higher alcohol in the first component (a1), which was  $a2/a1$ , outside the range of 0.5 - 2.0.

[0185]

With regard to the oxidative hair dye according to each Examples 28a and 28b of the first group, the foamy first component and the foamy second component were discharged from an aerosol-type discharge container and were shaken and mixed, and then the foamy mixture of them was subjected to the evaluation of "mixability" and of "hair dyeing power" as described above, which resulted in both "mixability" and "hair dyeing power" rankings, with regard to Examples 28a and 28b of the first group, of "4." This rank was inferior to the rank "5" obtained by the evaluation with regards to Example 28 of the first group.

[0186]

{Examples of the second group of aspects of the invention}

Examples of the second group of aspects of the invention are referred to as "Examples of the second group" hereinafter, and Comparative Examples of the second group of aspects of the invention are referred to as "Comparative Examples of the second group."

#### Preparation of an aerosol-type foamy oxidative hair dye composition

<Examples 1 - 39 of the second group>

A raw liquid used for a first component and a raw liquid used for a second component according to Examples 1 - 39 of the second

group were prepared by mixing each of ingredients shown in Tables 6 - 9.

[0187]

In addition, a raw liquid for a first component and a raw liquid for a second component according to each Examples of the second group were filled in an aerosol container having a simultaneous mixing-discharging mechanism, and a propellant (LPG) was filled in a ratio shown in each of the Tables 6 - 9 to prepare the first component and the second component according to each of the Examples of the second group.

[0188]

The first component and the second component of each Examples were discharged from the aerosol container to give an aerosol-type foamy oxidative hair dye composition according to each of the Examples 1 - 39 of the second group.

[0189]

<Comparative Examples 2-1 - 2-4>

Further, each of the ingredients shown in Table 10 were mixed to give a raw liquid for a first component and a raw liquid for a second component according to Comparative Examples 1 - 4 of the second group.

[0190]

Furthermore, a raw liquid for a first component and a raw liquid for a second component according to each of the Comparative Examples of the second group were filled in an aerosol container having a simultaneous mixing-discharging mechanism, and a propellant (LPG) was filled in a ratio shown in Table 10, respectively, to prepare the first component and the second component according to each of the Comparative Examples of the second group.

[0191]

The first component and the second component of each of the Comparative Examples were discharged from the aerosol container to give an aerosol-type foamy oxidative hair dye composition according to each of the Comparative Examples 1 - 4 of the second group.

[0192]

#### Evaluation of an aerosol-type foamy oxidative hair dye composition

##### <Hair dyeing treatment>

The hair dyeing treatment by using each of the compositions according to Examples 1 - 39 of the second group and Comparative Examples 1 - 4 of the second group was conducted in a similar manner to that described in the above paragraph 0178.

[0193]

##### <Evaluation 1: the quality of foams >

"A glutinous feeling" can be recognized by touching foams by hands or by observing foams. For convenience of digitization, the

following tests were conducted for the evaluation of the glutinous feeling.

Three grams of each compositions according to Examples 1 - 39 of the second group and Comparative Examples 1 - 4 of the second group was discharged from the above-described aerosol container onto a flat plate under the condition of 25° C. Immediately after discharging, a first component and a second component were mixed by hands and the plate was tilted by 45°. After one minute, 10 panelers visually evaluated (sensory evaluation) the degree the foams slid down (the glutinous feeling of foams). The degree of flowing down was ranked to five ranks by using the following evaluation criteria: "5" was no movement; "4" was hardly any movement; "3" was a small extent of movement; "2" was a large extent of movement; and "1" was a very large extent of movement. The average of ranks of evaluation thus obtained by 10 panelers was calculated with regard to each evaluation object, and when the average had numerical figures after a decimal point, the average was round to the nearest whole number, to determine an evaluation rank. The results of the evaluation are shown in Tables 6 - 10.

[0194]

<Evaluation 2: hair dyeing power>

A lock of hair after being subjected to a hair dyeing treatment by using each of the compositions according to Examples 1 - 39 of the second group and Comparative Examples 1 - 4 of the second group

was visually observed by panelers to evaluate the hair dyeing power (sensory evaluation). The evaluation criteria of the hair dyeing power was as described in the above paragraph 0179. The results of the evaluation are shown in Tables 6 - 10.

[0195]

<Evaluation 3: foamability>

Three grams of each of the compositions according to Examples 1 - 39 of the second group and Comparative Examples 1 - 4 of the second group was discharged from the above-described aerosol container onto a flat plate under the condition of 25° C. Immediately after discharging, bulkiness of foams (foamability) was visually evaluated (sensory evaluation) by 10 panelers.

Each of the compositions of Examples 1 - 39 of the second group exhibited good foamability. With regard to the compositions of Examples 5, 9, 22, 24, 25, and 26 of the second group, more panelers evaluated as "bulky" than other Examples of the second group, and the compositions of Examples 5, 9, 22, 24, 25, and 26 exhibited more excellent foamability.

[0196]

The method of description in Tables 6 - 10 is explained below. A numerical value provided in parentheses on the right hand of a higher alcohol indicates the number of carbon atoms of the higher alcohol. A numerical value provided in parentheses immediately after a POE which is a nonionic surfactant or an anionic surfactant

indicates the number of polymerization unit of the POE. "Hydrogen peroxide (35%)" represents 35% hydrogen peroxide water. The units of monoethanolamine solution, ammonia water and hydrogen peroxide water are % (w/w). When a component of which "Form of raw liquid" is an emulsified material, such a component still is an emulsified material after being filled with a propellant. The ratio of a raw liquid to a propellant is a mass ratio. "C16↑/C14↓" indicates a mass ratio of a higher alcohol with C16 or more to a higher alcohol with C14 or less. "SAA/OH" means a mass ratio of a surfactant to a higher alcohol.

[0197]

{Examples of the third group of aspects of the invention}

Hereinafter, Examples of the third group of aspects of the invention are referred to as "Examples of the third group" and Comparative Examples of the third group of aspects of the invention are referred to as "Comparative Examples of the third group".

#### Preparation of an aerosol-type foamy oxidative hair dye composition

The evaluation results of each of the Examples and Comparative Examples of the third group of aspects of the invention described below are shown in Tables 11 - 14 and 17.

[0198]

<Examples 1 - 33 of the third group>

By mixing each of ingredients shown in Tables 11 - 14 and 16, a raw liquid used for a first component according to Examples 1

- 33 of the third group was prepared as an emulsified material. In addition, by mixing each of the ingredients shown in Tables 15 and 17, a raw liquid used for a second component according to Examples 1 - 33 of the third group was prepared as an emulsified material. In Examples 1 - 32 of the third group, a raw liquid used for a first component shown on Tables 11 - 14 and a raw liquid used for a second component shown on Table 15 were used. In Example 33 of the third group, a raw liquid used for a first component shown on Table 16 and a raw liquid used for a second component shown on Table 17 were used.

[0199]

In addition, a raw liquid used for a first component and a raw liquid used for a second component according to each of the Examples of the third group were filled with an aerosol container having a simultaneous mixing-discharging mechanism, and a propellant (LPG) was filled into the aerosol container in a mass ratio shown in Tables 11 - 17 respectively, to prepare the first component and the second component of each Examples.

[0200]

The first component and the second component according to each of the Examples of the third group were discharged from the aerosol container to give an aerosol-type foamy oxidative hair dye composition according to each of Examples 1 - 33 of the third group.

Meanwhile, the first component and the second component according to each of Examples of the third group were emulsified materials.

[0201]

<Comparative Examples 1 - 5 of the third group>

In addition, by mixing each of ingredients shown in Table 14, a raw liquid used for a first component according to Comparative Examples 1 - 5 of the third group was prepared. Though the raw liquid for the first component according to each of the Comparative Examples 2- 5 of the third group could be prepared as an emulsified material, the raw liquid used for the first component according to Comparative Example 1 of the third group could not be prepared as an emulsified material. Further, by mixing each of ingredients shown in Table 15, a raw liquid used for a second component according to each of the Comparative Examples 1 - 5 of the third group was prepared.

[0202]

Furthermore, the raw liquid used for the first component and the raw liquid used for the second component according to Comparative Examples 2- 5 of the third group were filled into an aerosol container having a simultaneous mixing-discharging mechanism, and a propellant (LPG) was filled into the aerosol container in a mass ratio shown in Tables 14 and 15 respectively, to prepare the first component and the second component according to Comparative Examples 2- 5 of the third group. The first component and the second component according to each of the Comparative Examples were discharged from

the aerosol container, to give an aerosol-type foamy oxidative hair dye composition according to each of Comparative Examples 2- 5 of the third group.

[0203]

Meanwhile, the first component and the second component according to each of the Comparative Examples 2- 5 of the third group were emulsified materials. The first component according to Comparative Example 1 of the third group could not be obtained as an emulsified material, and therefore, the following evaluations other than measurement of the viscosity could not be conducted.

[0204]

#### Evaluation of an aerosol-type foamy oxidative hair dye composition

(A stability test of an emulsified material)

A test method: A raw liquid used for a first component according to each of the Examples 1 - 32 of the third group and Comparative Examples 2- 5 of the third group and a raw liquid used for a second component according to Example 33 of the third group were incubated in a thermostatic chamber at 60° C.

[0205]

An evaluation method: Whether an emulsified material was separated or not was confirmed by visual observation, and an evaluation was conducted based on the days required for the separation of the emulsified material.

An evaluation criteria: The evaluation was conducted by the following criteria: when the days required for the separation was 7 or more days, the rank was "5"; when the days required for the separation was three or more days and less than seven days, the rank was "4"; when the days required for the separation was one or more day and less than three days, the rank was "3"; when the time required for the separation was 12 hours or more and less than one day, the rank was "2"; and when the time required for the separation was less than 12 hours, the rank was "1".

[0206]

The above-described test was an accelerating test. Accordingly, when the result of the accelerating test was good, it can be reasonably expected that when each of the components in which a raw liquid used for each component and a propellant were filled is stored in an aerosol container at room temperature, good effects can be achieved.

[0207]

(A hair dyeing treatment)

The hair dyeing treatment by using each of the compositions according to Examples 1 - 33 of the third group and Comparative Examples 2- 5 of the third group, was conducted in a similar manner to that described in the above paragraph 0178.

[0208]

(A test of hair dyeing power)

A lock of hair after being subjected to a hair dyeing treatment by using each of the compositions according to Examples 1 - 33 of the third group and Comparative Examples 2- 5 of the third group was visually observed by panelers to evaluate the hair dyeing power (sensory evaluation). The evaluation criteria of the hair dyeing power was as described in the above paragraph 0179. The results of the evaluation are shown in Tables 11 - 14 and 17.

[0209]

(A test of the quality of foams)

Three grams of each of the first components according to Examples 1 - 32 of the third group and Comparative Examples 2 - 5 of the third group, as well as the second component according to Example 33 of the third group was discharged from the above-described aerosol container onto a flat plate under the condition of 25° C. The discharged materials were extended by the fingers and the fineness of the texture of foams was evaluated (not course, but fine foams were evaluated as being good). The evaluation criteria was as follows.

5: 7 or more panelers among ten panelers answered "excellent"

4: 5 - 6 panelers among ten panelers answered "excellent"

3: 3 - 4 panelers among ten panelers answered "excellent"

2: Two panelers among ten panelers answered "excellent"

1: One or no paneler among ten panelers answered "excellent"

[0210]

Hereinafter, states of foams are explained by using Reference Pictures 1 - 4, as shown in the drawings. Reference Picture 1, i.e. FIG. 1, shows foams with fine texture. Reference Picture 2, i.e. FIG. 2, shows foams with coarse texture which are not foams with fine texture. Reference Picture 3, i.e. FIG. 3, shows foams immediately after being discharged in the test. The left foams are foams with coarse texture. The right foams are foams with fine texture. Reference Picture 4, i.e. FIG. 4, is a picture of foams after being extended by the fingers in the test. The left foams are foams with coarse texture. The right foams are foams with fine texture.

[0211]

{Reference Picture 1}: FIG. 1 of the drawings

[0212]

{Reference Picture 2}: FIG. 2 of the drawings

[0213]

{Reference Picture 3}: FIG. 3 of the drawings

[0214]

{Reference Picture 4}: FIG. 4 of the drawings

[0215]

Meanwhile, foams of the second component shown in Table 15 and the first component shown in Table 16 were foams with fine texture.

[0216]

(A test of foamability)

A test of foamability was conducted in a manner described in the above paragraph 0195. Each of Examples 1 - 33 of the third group exhibited good foamability. In particular, with regard to Example 4 of the third group, more panelers evaluated as "bulky" than other Examples, and the composition according to Example 4 of the third group exhibited more excellent foamability. The results of this test are not shown in any Tables.

[0217]

(Measurement of viscosity)

A viscosity of each of a raw liquid used for a first component according to Examples 1 - 32 of the third group and Comparative Examples 1 - 5 of the third group as well as of a raw liquid used for a second component according to Example 33 of the third group was measured by using a B-type viscometer and a rotor No.2 under the conditions of a number of revolutions of 12 rpm and 25° C for one minute.

[0218]

The method of description in Tables is explained hereinafter. A numerical value provided in parentheses in the right of a higher alcohol indicates the number of carbon atoms of the higher alcohol. A numerical value provided in parentheses immediately after a POE, which is a nonionic surfactant, indicates the number of polymerization unit of the POE. In Tables, the formulation of a first component or a second component which is a raw liquid (given in mass%) as well as the ratio of a raw liquid to a propellant are described, and the ratio of a raw liquid to a propellant is given in a mass ratio. "Nonionic SAA/Higher OH" means a mass ratio of a nonionic surfactant to a higher alcohol. "C20<sub>↑</sub>/Total Higher OH" means a mass ratio of a higher alcohol with C20 or more to the total higher alcohols. The units of monoethanolamine solution, ammonia water, and hydrogen peroxide water are %(w/w).

[0219]

[Table 1]

|                  | Example 1                                                                | Example 2         | Example 3         | Example 4         | Example 5         | Example 6         | Example 7         | Example 8         | Example 9         |
|------------------|--------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| First component  |                                                                          | 0.7               | 0.7               | 0.7               | 0.7               | 1                 |                   | 0.7               |                   |
|                  | Cetanol (16)                                                             |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Hexyldecyl alcohol (16)                                                  |                   |                   |                   |                   |                   | 0.7               | 0.3               | 0.7               |
|                  | Stearyl alcohol (18)                                                     |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Behenyl alcohol (22)                                                     | 0.3               | 0.3               | 0.3               | 0.3               | 0.7               | 0.3               | 0.3               | 0.3               |
|                  | POE (10) lauryl ether                                                    | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               |
|                  | POE (30) lauryl ether                                                    |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) cetyl ether                                                     | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                  | POE (30) cetyl ether                                                     |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) stearyl ether                                                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (30) stearyl ether                                                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Stearyl trimethyl ammonium chloride                                      |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) sodium lauryl sulfate                                           |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Lauryldimethylaminoacetic acid betaine                                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Glycerin                                                                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 |
|                  | PEG400                                                                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Liquid paraffin                                                          |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Hydroxyethyl cellulose                                                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | 28% Ammonia water                                                        | 4                 |                   |                   | 4                 | 4                 | 4                 | 4                 | 4                 |
|                  | Ammonium bicarbonate                                                     |                   | 1.12              |                   |                   |                   |                   |                   |                   |
|                  | Ammonium carbonate                                                       |                   |                   | 1.12              |                   |                   |                   |                   |                   |
|                  | Ammonium phosphate                                                       |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Sodium sulfite                                                           | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | Diethylenetriaminepentaacetic acid pentasodium salt                      | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | Para-toluenediamine                                                      | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                  | Resorcin                                                                 | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
|                  | Para-aminophenol                                                         | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Meta-aminophenol                                                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | 5-Aminoorthocresol                                                       | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              |
| Second component | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|                  | Ratio of raw liquid to propellant                                        | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|                  | Myristyl alcohol (14)                                                    | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | Cetanol (16)                                                             | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                  | POE (10) lauryl ether                                                    | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
|                  | POE (30) cetyl ether                                                     | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
|                  | 35% Hydrogen peroxide                                                    | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |
|                  | Hydroxyethane diphosphonic acid                                          | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | Phenoxyethanol                                                           | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Stearyl trimethyl ammonium chloride                                      | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|                  | Ratio of raw liquid to propellant                                        | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|                  | Specific gravity of Second component/Specific gravity of First component | 1.666667          | 1.666667          | 1.666667          | 1.428571          | 1.666667          | 1.25              | 1.666667          | 1.666667          |
|                  | Second component OH/First component OH                                   | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               |
|                  | Specific gravity of Second component                                     | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Specific gravity of First component                                      | 0.06              | 0.06              | 0.06              | 0.07              | 0.06              | 0.08              | 0.06              | 0.06              |
|                  | Odor                                                                     | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |
|                  | Mixability                                                               | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |
|                  | Hair dyeing power                                                        | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |

[0220]

[Table 2]



|                  |                                                                          | Example 18        | Example 19        | Example 20        | Example 21        | Example 22        | Example 23        | Example 24        | Example 25        | Example 26        |
|------------------|--------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| First component  | Cetanol (16)                                                             | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               |
|                  | Hexyldecanol (16)                                                        |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Stearyl alcohol (18)                                                     |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Behenyl alcohol (22)                                                     | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | POE (10) lauryl ether                                                    | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               |
|                  | POE (30) lauryl ether                                                    |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) cetyl ether                                                     | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                  | POE (30) cetyl ether                                                     |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) stearyl ether                                                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Stearyl trimethyl ammonium chloride                                      |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) sodium lauryl sulfate                                           |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Lauryldimethylaminoacetic acid betaine                                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Glycerin                                                                 |                   |                   |                   |                   | 2                 | 2                 | 2                 | 2                 | 2                 |
|                  | PEG400                                                                   |                   | 2                 |                   |                   |                   |                   |                   |                   |                   |
|                  | Liquid paraffin                                                          |                   |                   | 2                 |                   |                   |                   |                   |                   |                   |
|                  | Hydroxyethyl cellulose                                                   |                   |                   |                   | 2                 |                   |                   |                   |                   |                   |
|                  | 28% Ammonia water                                                        | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
|                  | Ammonium bicarbonate                                                     |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Ammonium carbonate                                                       |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Ammonium phosphate                                                       |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Sodium sulfite                                                           | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | Diethylenetriaminepentacetic acid pentasodium salt                       | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | Para-toluenediamine                                                      | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                  | Resorcin                                                                 | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
|                  | Para-aminophenol                                                         | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Meta-aminophenol                                                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | 5-Aminoorthocresol                                                       | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              |
| Second component | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|                  | Ratio of raw liquid to propellant                                        | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|                  | Myristyl alcohol (14)                                                    | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | Cetanol (16)                                                             | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                  | POE (10) lauryl ether                                                    | 0.5               | 0.5               | 0.5               | 0.5               | 1                 | 1                 | 0.5               | 0.3               | 0.3               |
|                  | POE (30) cetyl ether                                                     | 0.5               | 0.5               | 0.5               | 0.5               | 1                 | 0.5               | 1                 | 0.5               | 0.3               |
|                  | 35% Hydrogen peroxide                                                    | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |
|                  | Hydroxyethane diphosphonic acid                                          | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | Phenoxyethanol                                                           | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Stearyl trimethyl ammonium chloride                                      | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|                  | Ratio of raw liquid to propellant                                        | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|                  | Specific gravity of Second component/Specific gravity of First component | 1.666667          | 1.666667          | 1.428571          | 2                 | 1.1               | 1.25              | 1.5               | 2.5               | 3                 |
|                  | Second component OH/First component OH                                   | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               | 1.2               |
|                  | Specific gravity of Second component                                     | 0.1               | 0.1               | 0.1               | 0.1               | 0.066             | 0.075             | 0.09              | 0.15              | 0.18              |
|                  | Specific gravity of First component                                      | 0.06              | 0.06              | 0.07              | 0.05              | 0.06              | 0.06              | 0.06              | 0.06              | 0.06              |
|                  | Odor                                                                     | 5                 | 5                 | 5                 | 5                 | 4                 | 4                 | 5                 | 5                 | 5                 |
|                  | Mixability                                                               | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 4                 |
|                  | Hair dyeing power                                                        | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 4                 |

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[Table 4]

|                  | Example 27                                                               | Example 28        | Example 29        | Example 30        | Example 31        | Example 32        | Example 33        | Example 34        |
|------------------|--------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| First component  | Cetanol (16)                                                             | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               | 0.7               |
|                  | Hexyldecanol (16)                                                        |                   |                   |                   |                   |                   |                   |                   |
|                  | Stearyl alcohol (18)                                                     |                   |                   |                   |                   |                   |                   |                   |
|                  | Behenyl alcohol (22)                                                     | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | POE (10) lauryl ether                                                    | 1.5               | 1.5               | 1.5               | 1.5               | 2                 | 0.5               | 0.3               |
|                  | POE (30) lauryl ether                                                    |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) cetyl ether                                                     | 1                 | 1                 | 1                 | 1                 | 1                 | 0.5               | 0.3               |
|                  | POE (30) cetyl ether                                                     |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) stearyl ether                                                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Stearyl trimethyl ammonium chloride                                      |                   |                   |                   |                   |                   |                   |                   |
|                  | POE (10) sodium lauryl sulfate                                           |                   |                   |                   |                   |                   |                   |                   |
|                  | Lauryl dimethylaminoacetic acid betaine                                  |                   |                   |                   |                   |                   |                   |                   |
|                  | Glycerin                                                                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 |
|                  | PEG400                                                                   |                   |                   |                   |                   |                   |                   |                   |
|                  | Liquid paraffin                                                          |                   |                   |                   |                   |                   |                   |                   |
|                  | Hydroxyethyl cellulose                                                   |                   |                   |                   |                   |                   |                   |                   |
|                  | 28% Ammonia water                                                        | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
|                  | Ammonium bicarbonate                                                     |                   |                   |                   |                   |                   |                   |                   |
|                  | Ammonium carbonate                                                       |                   |                   |                   |                   |                   |                   |                   |
|                  | Ammonium phosphate                                                       |                   |                   |                   |                   |                   |                   |                   |
| Second component | Sodium sulfite                                                           | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | Diethylenetriaminepentaacetic acid pentasodium salt                      | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                  | Para-toluenediamine                                                      | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                  | Resorcin                                                                 | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
|                  | Para-aminophenol                                                         | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Meta-aminophenol                                                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | 5-Aminoorthocresol                                                       | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              |
|                  | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|                  | Ratio of raw liquid to propellant                                        | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|                  | Myristyl alcohol (14)                                                    | 0.1               | 0.1               | 0.3               | 0.5               | 0.2               | 0.2               | 0.2               |
|                  | Cetanol (16)                                                             | 0.5               | 0.9               | 1.2               | 1.5               | 1                 | 1                 | 1                 |
|                  | POE (10) lauryl ether                                                    | 0.3               | 0.5               | 1                 | 1                 | 1                 | 0.2               | 0.1               |
|                  | POE (30) cetyl ether                                                     | 0.3               | 0.5               | 0.5               | 1                 | 0.5               | 0.2               | 0.1               |
|                  | 35% Hydrogen peroxide                                                    | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |
|                  | Hydroxyethane diphosphonic acid                                          | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                  | Phenoxyethanol                                                           | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Stearyl trimethyl ammonium chloride                                      | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                  | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|                  | Ratio of raw liquid to propellant                                        | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|                  | Specific gravity of Second component/Specific gravity of First component | 1.666667          | 1.666667          | 1.666667          | 1.666667          | 2                 | 2                 | 2                 |
|                  | Second component OH/First component OH                                   | 0.6               | 1                 | 1.5               | 2                 | 1.2               | 1.2               | 1.2               |
|                  | Specific gravity of Second component                                     | 0.1               | 0.1               | 0.1               | 0.1               | 0.06              | 0.2               | 0.3               |
|                  | Specific gravity of First component                                      | 0.06              | 0.06              | 0.06              | 0.06              | 0.03              | 0.1               | 0.15              |
|                  | Odor                                                                     | 5                 | 5                 | 5                 | 5                 | 4                 | 5                 | 5                 |
|                  | Mixability                                                               | 4                 | 5                 | 5                 | 4                 | 5                 | 4                 | 3                 |
|                  | Hair dyeing power                                                        | 4                 | 5                 | 5                 | 4                 | 5                 | 4                 | 3                 |

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[Table 5]

|                  |                                                                          | Example 35        | Example 36        | Example 37        | Example 38        | Comparative Example 1 | Comparative Example 2 |
|------------------|--------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|-----------------------|
| First component  | Cetanol (16)                                                             | 0.7               | 0.7               | 0.7               | 0.7               | 0.7                   | 0.7                   |
|                  | Hexyldecanol (16)                                                        |                   |                   |                   |                   |                       |                       |
|                  | Stearyl alcohol (18)                                                     |                   |                   |                   |                   |                       |                       |
|                  | Behenyl alcohol (22)                                                     | 0.3               | 0.3               | 0.3               | 0.3               | 0.3                   | 0.3                   |
|                  | POE (10) lauryl ether                                                    | 1.5               | 1.5               | 1.5               | 1.5               | 1.5                   | 1.5                   |
|                  | POE (30) lauryl ether                                                    |                   |                   |                   |                   |                       |                       |
|                  | POE (10) cetyl ether                                                     | 1                 | 1                 | 1                 | 1                 | 1                     | 1                     |
|                  | POE (30) cetyl ether                                                     |                   |                   |                   |                   |                       |                       |
|                  | POE (10) stearyl ether                                                   |                   |                   |                   |                   |                       |                       |
|                  | Stearyl trimethyl ammonium chloride                                      |                   |                   |                   |                   |                       |                       |
|                  | POE (10) sodium lauryl sulfate                                           |                   |                   |                   |                   |                       |                       |
|                  | Lauryldimethylaminoacetic acid betaine                                   |                   |                   |                   |                   |                       |                       |
|                  | Glycerin                                                                 | 2                 | 2                 | 2                 | 2                 | 2                     | 2                     |
|                  | PEG400                                                                   |                   |                   |                   |                   |                       |                       |
|                  | Liquid paraffin                                                          |                   |                   |                   |                   |                       |                       |
|                  | Hydroxyethyl cellulose                                                   |                   |                   |                   |                   |                       |                       |
|                  | 28% Ammonia water                                                        | 4                 | 4                 | 4                 | 4                 | 4                     | 4                     |
|                  | Ammonium bicarbonate                                                     |                   |                   |                   |                   |                       |                       |
|                  | Ammonium carbonate                                                       |                   |                   |                   |                   |                       |                       |
|                  | Ammonium phosphate                                                       |                   |                   |                   |                   |                       |                       |
|                  | Sodium sulfite                                                           | 0.3               | 0.3               | 0.3               | 0.3               | 0.3                   | 0.3                   |
|                  | Diethylenetriaminepentacetic acid pentasodium salt                       | 0.3               | 0.3               | 0.3               | 0.3               | 0.3                   | 0.3                   |
|                  | Para-toluidinediamine                                                    | 1                 | 1                 | 1                 | 1                 | 1                     | 1                     |
| Second component | Resorcin                                                                 | 0.5               | 0.5               | 0.5               | 0.5               | 0.5                   | 0.5                   |
|                  | Para-aminophenol                                                         | 0.1               | 0.1               | 0.1               | 0.1               | 0.1                   | 0.1                   |
|                  | Meta-aminophenol                                                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2                   | 0.2                   |
|                  | 5-Aminoorthocresol                                                       | 0.07              | 0.07              | 0.07              | 0.07              | 0.07                  | 0.07                  |
|                  | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity     | Residual quantity     |
|                  | Ratio of raw liquid to propellant                                        | 93:7              | 97:3              | 95:5              | 95:5              | 95:5                  | 95:5                  |
|                  | Myristyl alcohol (14)                                                    | 0.2               | 0.2               | 0.2               | 0.2               | 0.2                   | 0.2                   |
|                  | Cetanol (16)                                                             | 1                 | 1                 | 1                 | 1                 | 0.5                   | 1                     |
|                  | POE (10) lauryl ether                                                    | 0.5               | 0.5               | 0.5               | 0.5               | 2                     | 0.2                   |
|                  | POE (30) cetyl ether                                                     | 0.5               | 0.5               | 0.5               | 0.5               | 1                     | 0.2                   |
|                  | 35% Hydrogen peroxide                                                    | 5                 | 5                 | 5                 | 5                 | 5                     | 5                     |
|                  | Hydroxyethane diphosphonic acid                                          | 0.1               | 0.1               | 0.1               | 0.1               | 0.1                   | 0.1                   |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt                         | 0.2               | 0.2               | 0.2               | 0.2               | 0.2                   | 0.2                   |
|                  | Phenoxyethanol                                                           | 0.1               | 0.1               | 0.1               | 0.1               | 0.1                   | 0.1                   |
|                  | Stearyl trimethyl ammonium chloride                                      | 0.1               | 0.1               | 0.1               | 0.1               | 0.1                   | 0.1                   |
|                  | Purified water                                                           | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity     | Residual quantity     |
|                  | Ratio of raw liquid to propellant                                        | 95:5              | 95:5              | 93:7              | 97:3              | 95:5                  | 95:5                  |
|                  | Specific gravity of Second component/Specific gravity of First component | 2                 | 1.428571          | 1.5               | 1.833333          | 0.833333              | 3.333333              |
|                  | Second component OH/First component OH                                   | 1.2               | 1.2               | 1.2               | 1.2               | 0.7                   | 1.2                   |
|                  | Specific gravity of Second component                                     | 0.1               | 0.1               | 0.09              | 0.11              | 0.05                  | 0.2                   |
|                  | Specific gravity of First component                                      | 0.05              | 0.07              | 0.06              | 0.06              | 0.06                  | 0.06                  |
|                  | Odor                                                                     | 5                 | 5                 | 5                 | 5                 | 1                     | 5                     |
|                  | Mixability                                                               | 5                 | 5                 | 5                 | 5                 | 4                     | 1                     |
|                  | Hair dyeing power                                                        | 5                 | 5                 | 5                 | 5                 | 4                     | 2                     |

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[Table 6]

|                  | Example 1                                           | Example 2           | Example 3           | Example 4           | Example 5           | Example 6           | Example 7           | Example 8           | Example 9           |
|------------------|-----------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| First component  | Myristyl alcohol (14)                               |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Cetanol (16)                                        | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Stearyl alcohol (18)                                |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl alcohol (22)                                |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (2) lauryl ether                                | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (30) cetyl ether                                | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (9) lauryl ether                                | 1.5                 | 1.5                 |                     |                     |                     |                     |                     |                     |
|                  | POE (50) oleylether                                 | 1.5                 | 1.5                 |                     |                     |                     |                     |                     |                     |
|                  | Polyethylene glycol 400                             | 4                   | 2                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | 1,3-Butylene glycol                                 | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   |
|                  | Glycerin                                            |                     | 3                   |                     |                     |                     |                     |                     |                     |
|                  | Sodium sulfite                                      | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | Diethylenetriaminepentaacetic acid pentasodium salt | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | 28% Ammonia water                                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   |
|                  | 70% Monoethanolamine solution                       | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | Para-toluidinediamine                               | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Resorcin                                            | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Para-aminophenol                                    | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Meta-aminophenol                                    | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | 5-Aminoorthoresol                                   | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                |
| Second component | Purified water                                      | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                   | 95:5                | 95:5                | 95:5                | 92:8                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                  | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | G16 T /C14 I                                        | -                   | -                   | -                   | -                   | -                   | -                   | -                   | -                   |
|                  | SAA/OH                                              | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   |
|                  | Lauryl alcohol (12)                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Myristyl alcohol (14)                               | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Cetanol (16)                                        | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Stearyl alcohol (18)                                |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Octyldodecanol (18)                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl alcohol (22)                                |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) cetyl ether                                | 0.8                 | 0.8                 | 0.8                 | 0.8                 | 0.8                 | 0.9                 |                     |                     |
|                  | POE (30) cetyl ether                                |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) lauryl ether                               |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) oleylether                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Hydrogen peroxide (35%)                             | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |
|                  | Hydroxyethane diphosphonic acid                     | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt    | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | Phenoxyethanol                                      | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Propylene glycol                                    | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Stearyl trimethyl ammonium chloride                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |                     | 0.9                 |                     |                     |
|                  | Lauryltrimethyl ammonium chloride                   |                     |                     |                     | 0.1                 |                     |                     |                     |                     |
|                  | Behenyl trimethyl ammonium chloride                 |                     |                     |                     |                     | 0.1                 |                     |                     |                     |
|                  | POE (10) sodium lauryl sulfate                      |                     |                     |                     |                     |                     |                     |                     | 0.9                 |
|                  | Purified water                                      | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                   | 95:5                | 95:5                | 92:8                | 97:3                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                  | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | G16 T /C14 I                                        | 10                  | 10                  | 10                  | 10                  | 10                  | 10                  | 10                  | 10                  |
|                  | SAA/OH                                              | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                |
|                  | Quality of foams                                    | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |
|                  | Hair dyeing power                                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |

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[Table 7]

|                  | Example 10                                         | Example 11          | Example 12          | Example 13          | Example 14          | Example 15          | Example 16          | Example 17          | Example 18          | Example 19          | Example 20          |
|------------------|----------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| First component  | Myristyl alcohol (14)                              |                     |                     |                     |                     | 0.3                 | 0.3                 |                     |                     |                     |                     |
|                  | Cetanol (16)                                       | 1                   | 1                   |                     |                     | 3                   | 3                   | 1                   | 1                   | 1                   | 1                   |
|                  | Stearyl alcohol (18)                               |                     |                     | 1                   |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl alcohol (22)                               |                     |                     |                     | 1                   |                     |                     |                     |                     |                     |                     |
|                  | POE (2) lauryl ether                               | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (30) cetyl ether                               | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (9) lauryl ether                               |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (50) oleyl ether                               |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Polyethylene glycol 400                            | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | 1,3-Butylene glycol                                | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   |
|                  | Glycerin                                           |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Sodium sulfite                                     | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | Diethylenetriaminepentacetic acid pentasodium salt | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | 28% Ammonia water                                  | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   |
|                  | 70% Monoethanolamine solution                      | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | Para-toluenediamine                                | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Resorcin                                           | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Para-aminophenol                                   | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Meta-aminophenol                                   | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | 5-Aminonaphthol                                    | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                |
|                  | Purified water                                     | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                  | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                 | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | C16 I /C14 I                                       | -                   | -                   | -                   | -                   | 10                  | 10                  | -                   | -                   | -                   | -                   |
| Second component | SAA/OH                                             | 10                  | 3                   | 3                   | 3                   | 0.909091            | 0.909091            | 3                   | 3                   | 3                   | 3                   |
|                  | Lauryl alcohol (12)                                |                     |                     | 0.1                 |                     |                     |                     |                     |                     |                     |                     |
|                  | Myristyl alcohol (14)                              | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Cetanol (16)                                       | 1                   | 0.2                 | 1                   | 1                   | 1                   | 1.1                 |                     |                     |                     | 0.5                 |
|                  | Stearyl alcohol (18)                               |                     |                     |                     |                     |                     |                     | 1                   |                     |                     |                     |
|                  | Octyldodecanol (18)                                |                     |                     |                     |                     |                     |                     |                     | 1                   |                     |                     |
|                  | Behenyl alcohol (22)                               |                     |                     |                     |                     |                     |                     |                     |                     | 1                   |                     |
|                  | POE (10) cetyl ether                               | 0.8                 | 0.2                 | 0.8                 | 0.8                 | 0.8                 | 0.8                 | 0.8                 | 0.8                 | 0.8                 | 0.8                 |
|                  | POE (30) cetyl ether                               |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) lauryl ether                              |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) oleyl ether                               |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Hydrogen peroxide (35%)                            | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |
|                  | Hydroxyethane diphosphonic acid                    | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt   | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | Phenoxyethanol                                     | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Propylene glycol                                   | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Stearyl trimethyl ammonium chloride                | 0.1                 | 0.05                | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Lauryltrimethylammonium chloride                   |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl trimethyl ammonium chloride                |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) sodium lauryl sulfate                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Purified water                                     | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                  | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                 | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | C16 I /C14 I                                       | 10                  | 2                   | 10                  | 10                  | 10                  | -                   | 10                  | 10                  | 10                  | 10                  |
|                  | SAA/OH                                             | 0.82                | 0.83                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                |
|                  | Quality of foams                                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |
|                  | Hair dyeing power                                  | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |

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[Table 8]

|                  | Example 21                                          | Example 22          | Example 23          | Example 24          | Example 25          | Example 26          | Example 27          | Example 28          | Example 29          | Example 30          |
|------------------|-----------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| First component  | Myristyl alcohol (14)                               |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Cetanol (16)                                        | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Stearyl alcohol (18)                                |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl alcohol (22)                                |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (2) lauryl ether                                | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (30) cetyl ether                                | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (9) lauryl ether                                |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (50) oleyl ether                                |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Polyethylene glycol 400                             | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | 1,3-Butylene glycol                                 | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   |
|                  | Glycerin                                            |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Sodium sulfite                                      | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | Diethylenetriaminepentaacetic acid pentasodium salt | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | 28% Ammonia water                                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   |
|                  | 70% Monoethanolamine solution                       | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | Para-toluidinediamine                               | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Resorcin                                            | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Para-aminophenol                                    | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Meta-aminophenol                                    | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | 5-Aminoorthoresol                                   | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                |
| Second component | Purified water                                      | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                   | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                  | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | C16 1 / C14 1                                       | —                   | —                   | —                   | —                   | —                   | —                   | —                   | —                   | —                   |
|                  | SAO/OH                                              | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   |
|                  | Lauryl alcohol (12)                                 |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Myristyl alcohol (14)                               | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 1.1                 | 0.27                | 0.2                 | 0.15                |
|                  | Cetanol (16)                                        | 1                   | 1                   | 1                   | 1                   | 1                   |                     | 0.83                | 0.9                 | 0.95                |
|                  | Stearyl alcohol (18)                                |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Octyldodecanol (18)                                 |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl alcohol (22)                                |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) cetyl ether                                |                     |                     | 0.1                 | 0.4                 | 0.7                 | 0.8                 | 0.8                 | 0.8                 | 0.8                 |
|                  | POE (30) cetyl ether                                | 0.8                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) lauryl ether                               |                     | 0.8                 | 0.7                 | 0.4                 | 0.1                 |                     |                     |                     |                     |
|                  | POE (10) oleyl ether                                |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Hydrogen peroxide (35%)                             | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |
|                  | Hydroxyethane diphosphonic acid                     | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt    | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | Phenoxethanol                                       | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Propylene glycol                                    | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Stearyl trimethyl ammonium chloride                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Lauryltrimethyl ammonium chloride                   |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl trimethyl ammonium chloride                 |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) sodium lauryl sulfate                      |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Purified water                                      | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                   | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                  | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | C16 1 / C14 1                                       | 10                  | 10                  | 10                  | 10                  | 10                  | —                   | 3.1                 | 4.5                 | 6.3                 |
|                  | SAO/OH                                              | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                | 0.82                |
|                  | Quality of foams                                    | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |
|                  | Hair dyeing power                                   | 5                   | 5                   | 5                   | 5                   | 5                   | 4                   | 3                   | 4                   | 5                   |

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[Table 9]

|                  | Example 31                                           | Example 32          | Example 33          | Example 34          | Example 35          | Example 36          | Example 37          | Example 38          | Example 39          |
|------------------|------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| First component  | Myristyl alcohol (14)                                |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Cetanol (16)                                         | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Stearyl alcohol (18)                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl alcohol (22)                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (2) lauryl ether                                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (30) cetyl ether                                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 | 1.5                 |
|                  | POE (6) lauryl ether                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (50) oleyl ether                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Polyethylene glycol 400                              | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | 1,3-Butylene glycol                                  | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   |
|                  | Glycerin                                             |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Sodium sulfite                                       | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | Diethylenetriamine/pentaacetic acid pentasodium salt | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 | 0.3                 |
|                  | 28% Ammonia water                                    | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   | 2                   |
|                  | 70% Monoethanolamine solution                        | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   |
|                  | Para-toluidinediamine                                | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
|                  | Resorcin                                             | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Para-aminophenol                                     | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Meta-aminophenol                                     | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | 5-Aminoorthoresol                                    | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                | 0.07                |
| Second component | Purified water                                       | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                    | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                   | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | C16 I / C14 I                                        | -                   | -                   | -                   | -                   | -                   | -                   | -                   | -                   |
|                  | SAA/OH                                               | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   | 3                   |
|                  | Lauryl alcohol (12)                                  |                     |                     |                     |                     | 0.2                 |                     |                     |                     |
|                  | Myristyl alcohol (14)                                | 0.08                | 0.06                | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.04                | 0.1                 |
|                  | Cetanol (16)                                         | 1.02                | 1.04                | 1                   | 1                   | 1                   | 1.5                 | 1                   | 1                   |
|                  | Stearyl alcohol (18)                                 |                     |                     |                     |                     | 1.5                 |                     |                     |                     |
|                  | Octyldodecanol (18)                                  |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl alcohol (22)                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) cetyl ether                                 | 0.8                 | 0.8                 | 0.1                 | 0.5                 | 1.1                 | 0.8                 | 0.8                 | 1.2                 |
|                  | POE (30) cetyl ether                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) lauryl ether                                |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) oleyl ether                                 |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Hydrogen peroxide (35%)                              | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   |
|                  | Hydroxyethane diphosphonic acid                      | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt     | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 | 0.2                 |
|                  | Phenoxethanol                                        | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Propylene glycol                                     | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 | 0.5                 |
|                  | Stearyl trimethyl ammonium chloride                  | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 | 0.1                 |
|                  | Lauryltrimethyl ammonium chloride                    |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Behenyl trimethyl ammonium chloride                  |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | POE (10) sodium lauryl sulfate                       |                     |                     |                     |                     |                     |                     |                     |                     |
|                  | Purified water                                       | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   | Residual quantity   |
|                  | Ratio of raw liquid to propellant                    | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                | 95:5                |
|                  | Form of raw liquid                                   | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material | Emulsified material |
|                  | C16 I / C14 I                                        | 12.8                | 17.3                | 10                  | 10                  | 10                  | 7.5                 | 25                  | 10                  |
|                  | SAA/OH                                               | 0.82                | 0.82                | 0.18                | 0.55                | 1.09                | 0.53                | 0.87                | 1.18                |
|                  | Quality of foams                                     | 5                   | 4                   | 3                   | 5                   | 5                   | 5                   | 3                   | 5                   |
|                  | Hair dyeing power                                    | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 5                   | 4                   |

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[Table 10]

|                  | Comparative Example 1                                | Comparative Example 2 | Comparative Example 3 | Comparative Example 4 |
|------------------|------------------------------------------------------|-----------------------|-----------------------|-----------------------|
| First component  | Myristyl alcohol (14)                                | 1                     |                       |                       |
|                  | Cetanol (16)                                         |                       | 0.3                   |                       |
|                  | Stearyl alcohol (18)                                 | 1                     |                       | 1                     |
|                  | Behenyl alcohol (22)                                 |                       |                       |                       |
|                  | POE (2) lauryl ether                                 | 1.5                   | 1.5                   | 3                     |
|                  | POE (30) cetyl ether                                 | 1.5                   | 1.5                   | 1.5                   |
|                  | POE (9) lauryl ether                                 |                       |                       |                       |
|                  | POE (50) oleylether                                  |                       |                       |                       |
|                  | Polyethylene glycol 400                              | 4                     | 4                     | 4                     |
|                  | 1,3-Butylene glycol                                  | 3                     | 3                     | 10                    |
|                  | Glycerin                                             |                       |                       |                       |
|                  | Sodium sulfite                                       | 0.3                   | 0.3                   | 0.3                   |
|                  | Diethylenetriamine/pentaacetic acid pentasodium salt | 0.3                   | 0.3                   | 0.3                   |
|                  | 28% Ammonia water                                    | 2                     | 2                     | 2                     |
|                  | 70% Monoethanolamine solution                        | 4                     | 4                     | 4                     |
|                  | Para-toluidinediamine                                | 1                     | 1                     | 1                     |
|                  | Resorcin                                             | 0.5                   | 0.5                   | 0.5                   |
|                  | Para-aminophenol                                     | 0.1                   | 0.1                   | 0.1                   |
|                  | Meta-aminophenol                                     | 0.2                   | 0.2                   | 0.2                   |
|                  | 5-Aminoorthocresol                                   | 0.07                  | 0.07                  | 0.07                  |
| Second component | Purified water                                       | Residual quantity     | Residual quantity     | Residual quantity     |
|                  | Ratio of raw liquid to propellant                    | 95:5                  | 95:5                  | 95:5                  |
|                  | Form of raw liquid                                   | Emulsified material   | Solubilized material  | Emulsified material   |
|                  | G16 I /C14 I                                         | —                     | —                     | —                     |
|                  | SAA/OH                                               | 3                     | 3                     | 15                    |
|                  | Lauryl alcohol (12)                                  |                       |                       | 3                     |
|                  | Myristyl alcohol (14)                                | 1.1                   |                       |                       |
|                  | Cetanol (16)                                         |                       | 0.1                   | 0.3                   |
|                  | Stearyl alcohol (18)                                 |                       | 1.1                   | 1                     |
|                  | Octyldodecanol (18)                                  |                       |                       |                       |
|                  | Behenyl alcohol (22)                                 |                       |                       |                       |
|                  | POE (10) cetyl ether                                 |                       |                       |                       |
|                  | POE (30) cetyl ether                                 | 0.8                   | 0.8                   | 0.8                   |
|                  | POE (10) lauryl ether                                |                       |                       |                       |
|                  | POE (10) oleylether                                  |                       |                       | 3                     |
|                  | Hydrogen peroxide (35%)                              | 5                     | 5                     | 5                     |
|                  | Hydroxyethane diphosphonic acid                      | 0.1                   | 0.1                   | 0.1                   |
|                  | Hydroxyethane diphosphonic acid tetrasodium salt     | 0.2                   | 0.2                   | 0.2                   |
|                  | Phenoxyethanol                                       | 0.1                   | 0.1                   | 0.1                   |
|                  | Propylene glycol                                     | 0.5                   | 0.5                   | 0.5                   |
|                  | Stearyl trimethyl ammonium chloride                  | 0.1                   | 0.1                   | 0.1                   |
|                  | Lauryltrimethylammonium chloride                     |                       |                       |                       |
|                  | Behenyl trimethyl ammonium chloride                  |                       |                       |                       |
|                  | POE (10) sodium lauryl sulfate                       |                       |                       |                       |
|                  | Purified water                                       | Residual quantity     | Residual quantity     | Residual quantity     |
|                  | Ratio of raw liquid to propellant                    | 95:5                  | 95:5                  | 95:5                  |
|                  | Form of raw liquid                                   | Emulsified material   | Emulsified material   | Solubilized material  |
|                  | G16 I /C14 I                                         | —                     | —                     | 10                    |
|                  | SAA/OH                                               | 0.82                  | 0.82                  | 0.82                  |
|                  | Quality of foams                                     | 5                     | 1                     | 5                     |
|                  | Hair dyeing power                                    | 1                     | 5                     | 1                     |

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[Table 11]

|                                                     | Example 1         | Example 2         | Example 3         | Example 4         | Example 5         | Example 6         | Example 7         | Example 8         | Example 9         | Example 10        |
|-----------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                                                     | 0.9               | 0.9               | 0.9               | 0.9               | 0.9               | 0.9               | 0.9               |                   |                   |                   |
| Myristyl alcohol (14)                               |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| Cetanol (16)                                        |                   |                   |                   |                   |                   |                   |                   |                   |                   | 0.9               |
| Stearyl alcohol (18)                                |                   |                   |                   |                   |                   |                   |                   | 0.9               |                   |                   |
| Hexyldecanol (16)                                   |                   |                   |                   |                   |                   |                   |                   |                   | 0.9               |                   |
| Arachyl alcohol (20)                                |                   |                   |                   |                   |                   |                   |                   |                   |                   | 0.3               |
| Behenyl alcohol (22)                                | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |                   |
| POE (10) lauryl ether                               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               |
| POE (10) cetyl ether                                | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 |
| POE (30) cetyl ether                                |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| POE (10) oleyl ether                                |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| POE (10) isostearyl ether                           |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| Polyethylene glycol 400                             | 4                 |                   | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
| 1,3-Butylene glycol                                 | 3                 |                   | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 |
| Glycerin                                            |                   | 8                 |                   |                   |                   |                   |                   |                   |                   |                   |
| Stearyl trimethyl ammonium chloride                 |                   |                   | 0.5               |                   |                   |                   |                   |                   |                   |                   |
| Lauryltrimethylammonium chloride                    |                   |                   |                   | 0.5               |                   |                   |                   |                   |                   |                   |
| Liquid paraffin                                     |                   |                   |                   |                   | 3                 |                   |                   |                   |                   |                   |
| Sodium sulfite                                      | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
| Diethylenetriaminepentaacetic acid pentasodium salt | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
| 28% Ammonia water                                   | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 |
| 70% Monoethanolamine solution                       | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
| Para-toluidinediamine                               | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
| Resorcin                                            | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
| Para-aminophenol                                    | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
| Meta-aminophenol                                    | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
| 5-Aminoorthocresol                                  | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              |
| Purified water                                      | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
| Ratio of raw liquid to propellant                   | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 93:7              | 95:5              | 95:5              | 95:5              | 95:5              |
| Nonionic SAA/Higher OH                              | 2.92              | 2.92              | 2.92              | 2.92              | 2.92              | 2.92              | 2.92              | 2.92              | 2.92              | 2.92              |
| C20 ↑ /Total higher OH                              | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             |
| Viscosity (mPa·s)                                   | 400               | 400               | 400               | 400               | 400               | 400               | 350               | 400               | 300               | 400               |
| Stability of emulsified material                    | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |
| Hair dyeing power                                   | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |
| Quality of foams                                    | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 |

[0230]

[Table 12]

|  | Example 11        | Example 12        | Example 13        | Example 14        | Example 15        | Example 16        | Example 17        | Example 18        | Example 19        |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|  |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|  | 0.9               | 0.9               | 0.9               | 0.9               | 0.9               | 0.9               | 0.9               | 0.45              | 0.225             |
|  |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|  |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|  | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.15              | 0.075             |
|  |                   |                   |                   | 0.825             | 2                 | 4                 | 6                 | 6                 | 6                 |
|  | 2                 |                   |                   | 1.1               | 2.67              | 5.33              | 8                 | 8                 | 8                 |
|  | 1.5               | 1.5               |                   |                   |                   |                   |                   |                   |                   |
|  |                   | 2                 | 2                 |                   |                   |                   |                   |                   |                   |
|  |                   |                   | 1.5               |                   |                   |                   |                   |                   |                   |
|  | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
|  | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 |
|  |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|  |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|  |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|  |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|  | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|  | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|  | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 |
|  | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
|  | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|  | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
|  | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|  | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|  | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              |
|  | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|  | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|  | 2.92              | 2.92              | 2.92              | 1.60              | 3.89              | 7.78              | 11.67             | 23.33             | 46.67             |
|  | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             | 0.250             |
|  | 400               | 400               | 400               | 400               | 400               | 400               | 400               | 300               | 200               |
|  | 5                 | 5                 | 5                 | 4                 | 5                 | 5                 | 5                 | 5                 | 5                 |
|  | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 4                 | 4                 | 4                 |
|  | 5                 | 5                 | 5                 | 4                 | 5                 | 5                 | 5                 | 5                 | 5                 |

[0231]

[Table 13]

|                 | Example 20                                          | Example 21        | Example 22        | Example 23        | Example 24        | Example 25        | Example 26        | Example 27        | Example 28        |
|-----------------|-----------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                 | Myristyl alcohol (14)                               |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Cetanol (16)                                        | 1.19              | 1.05              | 1                 | 0.8               | 0.65              | 0.2               | 1.5               | 0.1               |
|                 | Stearyl alcohol (18)                                |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Hexyldecanol (16)                                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Arachyl alcohol (20)                                |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Behenyl alcohol (22)                                | 0.01              | 0.15              | 0.2               | 0.4               | 0.55              | 0.1               | 0.3               | 0.6               |
|                 | POE (10) lauryl ether                               | 1.5               | 1.5               | 1.5               | 1.5               | 1.5               | 3                 | 1.5               | 1.5               |
|                 | POE (10) cetyl ether                                | 2                 | 2                 | 2                 | 2                 | 2                 | 4                 | 2                 | 2                 |
|                 | POE (30) cetyl ether                                |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | POE (10) oleyl ether                                |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | POE (10) isostearyl ether                           |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Polyethylene glycol 400                             | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
|                 | 1,3-Butylene glycol                                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 | 3                 |
|                 | Glycerin                                            |                   |                   |                   |                   |                   |                   |                   |                   |
| First component | Stearyl trimethyl ammonium chloride                 |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Lauryltrimethylammonium chloride                    |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Liquid paraffin                                     |                   |                   |                   |                   |                   |                   |                   |                   |
|                 | Sodium sulfite                                      | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                 | Diethylenetriaminepentaacetic acid pentasodium salt | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               | 0.3               |
|                 | 28% Ammonia water                                   | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 | 2                 |
|                 | 70% Monoethanolamine solution                       | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 |
|                 | Para-toluenediamine                                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 | 1                 |
|                 | Resorcin                                            | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               | 0.5               |
|                 | Para-aminophenol                                    | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               | 0.1               |
|                 | Meta-aminophenol                                    | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               | 0.2               |
|                 | 5-Aminoorthocresol                                  | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              | 0.07              |
|                 | Purified water                                      | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity |
|                 | Ratio of raw liquid to propellant                   | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              | 95:5              |
|                 | Nonionic SAA/Higher OH                              | 2.92              | 2.92              | 2.92              | 2.92              | 2.92              | 23.33             | 1.94              | 5.00              |
|                 | C20 1/Total higher OH                               | 0.008             | 0.125             | 0.167             | 0.333             | 0.458             | 0.333             | 0.167             | 0.857             |
|                 | Viscosity (mPa·s)                                   | 600               | 450               | 450               | 350               | 300               | 200               | 1500              | 350               |
|                 | Stability of emulsified material                    | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 5                 | 4                 |
|                 | Hair dyeing power                                   | 4                 | 5                 | 5                 | 5                 | 5                 | 4                 | 5                 | 5                 |
|                 | Quality of foams                                    | 5                 | 5                 | 5                 | 5                 | 5                 | 4                 | 5                 | 5                 |

[0232]

[Table 14]

|                                                  | Example 29        | Example 30        | Example 31        | Example 32        | Comparative Example 1 | Comparative Example 2 | Comparative Example 3 | Comparative Example 4 | Comparative Example 5 |
|--------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                                                  | 0.6               | 0.6               | 0.05              | 1.19              | 0.5                   |                       | 0.7                   | 0.2                   | 0.5                   |
| Myristyl alcohol (14)                            |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Cetanol (16)                                     |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Stearyl alcohol (18)                             |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Hexyldecanol (16)                                |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Arachyl alcohol (20)                             |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Behenyl alcohol (22)                             | 0.1               | 0.005             | 0.6               | 0.01              | 0.2                   | 0.7                   |                       | 0.1                   | 0.2                   |
| POE (10) lauryl ether                            | 1.5               | 1.5               | 1.5               | 8                 | —                     | 1.5                   | 1.5                   | 8                     | 0.3                   |
| POE (10) cetyl ether                             | 2                 | 2                 | 2                 | 10                | —                     | 2                     | 2                     | 8                     | 0.4                   |
| POE (30) cetyl ether                             |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| POE (10) oleylether                              |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| POE (10) isostearyl ether                        |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Polyethylene glycol 400                          | 4                 | 4                 | 4                 | 4                 | 4                     | 4                     | 4                     | 4                     | 4                     |
| 1,3-Butylene glycol                              | 3                 | 3                 | 3                 | 3                 | 3                     | 3                     | 3                     | 3                     | 3                     |
| Glycerin                                         |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Stearyl trimethyl ammonium chloride              |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Lauryltrimethylammonium chloride                 |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Liquid paraffin                                  |                   |                   |                   |                   |                       |                       |                       |                       |                       |
| Sodium sulfite                                   | 0.3               | 0.3               | 0.3               | 0.3               | 0.3                   | 0.3                   | 0.3                   | 0.3                   | 0.3                   |
| Diethylenetriaminediacetic acid pentasodium salt | 0.3               | 0.3               | 0.3               | 0.3               | 0.3                   | 0.3                   | 0.3                   | 0.3                   | 0.3                   |
| 28% Ammonia water                                | 2                 | 2                 | 2                 | 2                 | 2                     | 2                     | 2                     | 2                     | 2                     |
| 70% Monoethanolamine solution                    | 4                 | 4                 | 4                 | 4                 | 4                     | 4                     | 4                     | 4                     | 4                     |
| Para-tolulenediamine                             | 1                 | 1                 | 1                 | 1                 | 1                     | 1                     | 1                     | 1                     | 1                     |
| Resorcin                                         | 0.5               | 0.5               | 0.5               | 0.5               | 0.5                   | 0.5                   | 0.5                   | 0.5                   | 0.5                   |
| Para-aminophenol                                 | 0.1               | 0.1               | 0.1               | 0.1               | 0.1                   | 0.1                   | 0.1                   | 0.1                   | 0.1                   |
| Meta-aminophenol                                 | 0.2               | 0.2               | 0.2               | 0.2               | 0.2                   | 0.2                   | 0.2                   | 0.2                   | 0.2                   |
| 5-Aminoorthocresol                               | 0.07              | 0.07              | 0.07              | 0.07              | 0.07                  | 0.07                  | 0.07                  | 0.07                  | 0.07                  |
| Purified water                                   | Residual quantity | Residual quantity | Residual quantity | Residual quantity | Residual quantity     | Residual quantity     | Residual quantity     | Residual quantity     | Residual quantity     |
| Ratio of raw liquid to propellant                | 95:5              | 95:5              | 95:5              | 95:5              | 95:5                  | 95:5                  | 95:5                  | 95:5                  | 95:5                  |
| Nonionic SAA/Higher OH                           | 5.00              | 5.79              | 5.38              | 15.00             | 0                     | 5.00                  | 5.00                  | 53.33                 | 1.00                  |
| C20 I /Total higher OH                           | 0.143             | 0.008             | 0.923             | 0.008             | 0.286                 | 1.000                 | 0.000                 | 0.333                 | 0.286                 |
| Viscosity (mPa·s)                                | 450               | 450               | 320               | 1000              | 400                   | 300                   | 500                   | 300                   | 400                   |
| Stability of emulsified material                 | 5                 | 5                 | 4                 | 5                 | —                     | 1                     | 5                     | 5                     | 2                     |
| Hair dyeing power                                | 5                 | 3                 | 5                 | 3                 | —                     | 5                     | 1                     | 1                     | 5                     |
| Quality of foams                                 | 5                 | 5                 | 4                 | 4                 | —                     | 4                     | 5                     | 3                     | 3                     |

[0233]

[Table 15]

<Second component>

|                                                  |                   |
|--------------------------------------------------|-------------------|
| Myristyl alcohol (14)                            | 0.2               |
| Cetanol (16)                                     | 0.8               |
| POE (10) cetyl ether                             | 0.5               |
| POE (10) lauryl ether                            | 0.5               |
| 35% Hydrogen peroxide water                      | 5                 |
| Hydroxyethane diphosphonic acid                  | 0.1               |
| Hydroxyethane diphosphonic acid tetrasodium salt | 0.2               |
| Phenoxyethanol                                   | 0.1               |
| Propylene glycol                                 | 0.5               |
| Stearyl trimethyl ammonium chloride              | 0.1               |
| Purified water                                   | Residual quantity |
| Ratio of raw liquid to propellant                | 95 : 5            |

[0234]

[Table 16]

<First component>

|                                                     |                   |
|-----------------------------------------------------|-------------------|
| Cetanol (16)                                        | 0.8               |
| Behenyl alcohol (22)                                | 0.2               |
| POE (2) lauryl ether                                | 1.5               |
| POE (30) cetyl ether                                | 1.5               |
| Polyethylene glycol 400                             | 4                 |
| 1,3-Butylene glycol                                 | 3                 |
| Sodium sulfite                                      | 0.3               |
| Diethylenetriaminepentaacetic acid pentasodium salt | 0.3               |
| 28% Ammonia water                                   | 2                 |
| 70% Monoethanolamine solution                       | 4                 |
| Para-toluidenediamine                               | 1                 |
| Resorcin                                            | 0.5               |
| Para-aminophenol                                    | 0.1               |
| Meta-aminophenol                                    | 0.2               |
| 5-Aminoorthocresol                                  | 0.07              |
| Purified water                                      | Residual quantity |
| Ratio of raw liquid to propellant                   | 95 : 5            |

[0235]

[Table 17]

<Second component>

|                                                  | Example 33        |
|--------------------------------------------------|-------------------|
| Cetanol (16)                                     | 0.9               |
| Behenyl alcohol (22)                             | 0.3               |
| POE (10) lauryl ether                            | 1.5               |
| POE (10) cetyl ether                             | 2                 |
| Polyethylene glycol 400                          | 4                 |
| 1,3-Butylene glycol                              | 3                 |
| 35% Hydrogen peroxide water                      | 5                 |
| Stearyl trimethyl ammonium chloride              | 0.1               |
| Hydroxyethane diphosphonic acid                  | 0.1               |
| Hydroxyethane diphosphonic acid tetrasodium salt | 0.2               |
| Phenoxyethanol                                   | 0.1               |
| Purified water                                   | Residual quantity |
| Ratio of raw liquid to propellant                | 95:5              |
| Nonionic SAA/Higher OH                           | 2.92              |
| C20 ↑ /Total higher OH                           | 0.250             |
| Viscosity (mPa·s)                                | 400               |
| Stability of emulsified material                 | 5                 |
| Hair dyeing power                                | 5                 |
| Quality of foams                                 | 5                 |

## Industrial Applicability

[0236]

According to the present invention, an aerosol-type foamy oxidative hair dye composition which can suppress the irritating odor, can ensure mixability of a first component and a second component discharged in foamy states at the time of application, and can maintain good hair-dyeing properties is provided.

## CLAIMS

[Claim 1]

An aerosol-type foamy oxidative hair dye composition, the composition comprising:

a first component containing an alkali agent selected from ammonia or an ammonium salt, and

a second component containing an oxidizing agent,

wherein both components are discharged at the time of application in foamy states and mixed, and

wherein the ratio of a foam specific gravity of the first component ( $f_1$ ) to a foam specific gravity of the second component ( $f_2$ ), that is  $f_2/f_1$ , is in the range of 1.1 - 3 at the time of discharge of the aerosol-type foamy oxidative hair dye composition.