

DESCRIPTION

GEL COMPOSITION FOR HAIR

Technical Field

5 [0001]

The present invention is related to a gel composition for hair.

Background Art

[0002]

10 Compositions for hair such as styling agents are generally employed by taking the composition up from a container with a hand and applying it onto hair. In cosmetics for hair, fixing properties capable of maintaining shapes (hereinafter, referred to as “setting performance”) and a glossy external appearance (hereinafter, referred to as “glossiness”) are desired when applied onto hair.

15 Recently, there is demand for a composition for hair that do not impart a sticky sensation on hands or hair, while having setting performance and glossiness. Gel compositions that include both a cationic polymer that realizes setting performance and gloss, and an anionic polymer that realizes a sensation of freshness, have been proposed as such a composition (refer to Patent Literature 1 and 2).

20 In a composition that includes both a cationic polymer and an anionic polymer, bonds are formed between portions of the cationic polymer charged with positive electricity and portions of the anionic polymer charged with negative electricity, to form complexes. Further, weak bonds are formed among complexes in the vicinities of each other, resulting in a thickened gel having a sensation of elasticity being formed.

25

Citation List

Patent Literature

[0003]

[Patent Literature 1]

30 Japanese Examined Patent Publication No. S62-7164

[Patent Literature 2]

Japanese Unexamined Patent Publication No. 2003-34614

Summary of the Invention

Technical Problem

[0004]

5 However, not a great amount of development has been conducted for compositions containing a cationic polymer and an anionic polymer, because there was a problem that the stability over time of external appearance and viscosity are poor. In addition, the preparations disclosed in the above patent literature enable obtainment of setting performance and glossiness, there is a problem that a sensation of stickiness on the hands and in the hair remain.

10 The present invention has been developed in view of the foregoing circumstances. It is an object to provide a gel composition for hair that exhibits superior ease of take up by a hand, sensation of freshness on the hand, and ease of application to hair, without loss of setting performance or glossiness.

15 Solution to Problem

[0005]

 As a result of intense and focused research by the present inventors, it was discovered that by setting the content ratio of a cationic polymer and an anionic polymer in a gel composition for hair that contains the cationic polymer and the anionic polymer,
20 a sensation that the agent crumbles onto the hand, and accompanying this sensation, a gel composition for hair that does not exhibit a sensation of stickiness can be obtained, to achieve the present invention. That is, the present invention is a gel composition for hair, comprising:

- 25 (A) an anionic polymer;
 (B) a cationic polymer; and
 (C) water;

 the content of the anionic polymer (A) being 0.2% by mass or greater and less than 1.0% by mass with respect to 100% by mass of the gel composition for hair;

30 the ratio of the cationic polymer (B) with respect to the anionic polymer is 0.17 or greater and 1.80 or less;

 the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized is 1550 mPa·s or greater and 170000 mPa·s

or less;

the viscosity of the gel composition for hair is greater than 1.0 times and less than 8.0 times the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized; and

5 the pH at 25°C is 5.50 or greater and 8.20 or less.

[0006]

It is preferable for the cationic polymer (B) to be at least one species selected from among: vinyl pyrrolidone · N, N-dimethyl amino ethyl methacrylic acid copolymer diethyl sulfate, O- [2-hydroxy-3- (trimethyl ammonio) propyl] hydroxyethyl
10 cellulose chloride, O- [2-hydroxy-3- (trimethyl ammonio) propyl guar gum chloride, and hydroxy propyl trimonium chloride starch.

[0007]

It is preferable for the anionic polymer (A) to be a carboxyl group containing water soluble polymer.

15 It is preferable for the carboxyl group containing water soluble polymer to be an acrylic acid methacrylic acid alkyl ester copolymer.

[0008]

It is preferable for the content of cationized nitrogen in the cationic polymer (B) to be within a range from 1.0 to 2.5%.

20 [0009]

It is preferable for the viscosity of the gel composition for hair to be 12000 mPa·s or greater and 170000 mPa·s or less.

[0010]

25 It is preferable for the content of the anionic polymer to be 0.3% by mass or greater and 0.8% by mass or less.

Note that the viscosities of the cationic polymer, the anionic polymer, and the gel composition for hair are values of viscosities (mPa·s) which are measured by Vismetron viscometer (BH type, by Shibaura Systems) under conditions in which a Number 6 spindle was employed at a rotational speed of 10 rpm and a temperature of
30 30°C.

[Advantageous Effects of the Invention]

[0011]

The gel composition for hair of the present invention exhibits superior ease of take up by a hand, sensation of freshness on the hand, and ease of application to hair, without loss of setting performance or glossiness.

5 Description of Embodiments

[0012]

Hereinafter, a gel composition for hair of the present invention will be described in detail.

[0013]

10 (A): Anionic Polymer

The anionic polymer has a viscosity of 1550 mPa·s or greater and 170000 mPa·s or less in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized. By the viscosity being 1550 mPa·s or greater in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized, elasticity of the gel can be obtained. By the viscosity being 170000 mPa·s or less in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized, a sensation of freshness can be obtained. It is more preferable for the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized to be 12000 mPa·s or greater and 50000 mPa·s or less, and still more preferably 12000 mPa·s or greater and 50000 mPa·s or less.

[0014]

The anionic polymer is not particularly limited as long the viscosity thereof is within the above range and it is possible to utilize it as a raw material for a cosmetic. However, a carboxyl group containing water soluble polymer, for example, is preferable, and a carboxy vinyl polymer is more preferable. It is preferable for the carboxy vinyl polymer to be an acrylic acid · methacrylic acid alkyl ester copolymer. The acrylic acid · methacrylic acid alkyl ester copolymer is a copolymer which has a hydrophilic portion derived from the carboxyl group and a lipophilic portion derived from the alkyl group. The acrylic acid · methacrylic acid alkyl ester copolymer enables adhesion properties of the gel composition for hair to hair and salt tolerance to become favorable.

[0015]

Specific examples of the carboxy vinyl polymer include, for example, a

carboxy vinyl polymer such as CARBOPOL 940, 941, 980, and 981 (by Lubrizol Advanced Materials); an acrylic acid · alkyl methacrylate copolymer such as PEMULEN TR-1, TR-2, Carbopol ETD2020 polymer, 1342 polymer, 1382 polymer, Ultrez 20 polymer, and Ultrez 21 polymer (by Lubrizol Advanced Materials); an alkyl
5 acrylate/alkyl methacrylate polyoxyethylene ester copolymer such as ACULYN 22 and 23 (by ISP Japan), an alkyl acrylate · itaconic alkyl polyoxyethylene ester copolymer such as STRUCTURE Series (by NSC); and a methyl vinyl ether · maleic anhydride · decadiene copolymer such as STABILEZE Series (by ISP Japan), etc.

[0016]

10 It is preferable for the acrylic acid methacrylic acid alkyl ester copolymer which is utilized in the present invention to be that in which the carbon number of the alkyl group in the methacrylic acid unit is within a range from 10 to 30, from the viewpoint of the transparency and the stability of viscosity of the gel composition for hair.

15 Examples of commercially available acrylic acid methacrylic acid alkyl ester copolymers may include: PEMULEN TR-1 (acrylate/acrylic acid alkyl (C10-30) cross polymer), PEMULEN TR-2 (product name; by Lubrizol Advanced Materials), etc.

In the present invention, one type of anionic polymer may be blended, or two or more types may be mixed and blended into the composition.

20 [0017]

The content of the anionic polymer within the composition is 0.2% by mass or greater and less than 1.0% by mass with respect to 100% by mass of the gel composition for hair. A more preferable range is 0.3% by mass or greater and less than 0.8% by mass. By setting the content of the anionic polymer to be 0.2% by mass
25 or greater and less than 1.0% by mass, a sensation of stickiness can be prevented, and a sensation of freshness can be obtained.

[0018]

(B) Cationic Polymer

30 The gel composition for hair of the present invention contains a cationic polymer, from the viewpoint of fixing hair and imparting glossiness thereto. A known cationic polymer may be selected as that to be employed in the present invention as

appropriate. Examples of cationic polymers include: vinyl pyrrolidone · N, N-dimethyl amino ethyl methacrylic acid copolymer diethyl sulfate, dimethyl diallyl ammonium chloride · acrylamide copolymer, polydimethylmethylenepiperidinium chloride, O- [2-hydroxy-3- (trimethyl ammonio) propyl] hydroxyethyl cellulose chloride, O- [2-hydroxy-3- (trimethyl ammonio) propyl] guar gum chloride, 2-methacryloyloxyethyl phosphorylcholine · 2-hydroxy-3-methacryloyloxypropyltrimethylammonium chloride copolymer, O- (2-hydroxy-3- (trimethyl ammonio) propyl) locust bean gum chloride, hydroxypropyl trimonium chloride starch, vinyl pyrrolidone · N, N-dimethyl amino ethyl methacrylate · stearyl acrylate · tripropylene glycol diacrylate copolymer, etc. Among these, vinyl pyrrolidone · N, N-dimethyl amino ethyl methacrylic acid copolymer diethyl sulfate, O- [2-hydroxy-3- (trimethyl ammonio) propyl] hydroxyethyl cellulose chloride, O- [2-hydroxy-3- (trimethyl ammonio) propyl] guar gum chloride, and hydroxypropyl trimonium chloride starch are preferable.

[0019]

Examples of commercially available cationic polymers include, for example: COSQUAT GA 468 (by Osaka Organic Chemical Industry), cationic polymers of the H. C. Polymer series, such as H. C. Polymer 1S (M), and 1N (polyquaternium-11) (by Osaka Organic Chemical Industry), GAFQUAT 755-S (by ISP Japan), HC Polymer 1N (by Osaka Organic Chemical Industry), Polymer JR 400 (by Union Carbide Japan), Rhaball gum CG-M (by DSP Gokyo Food & Chemical), Sensomer CI-50 polymer (by Lubrizol Advanced Materials), Lipidure C (by NOF), etc. In the present invention, one type of cationic polymer may be blended, or two or more types may be mixed and blended into the composition.

[0020]

It is preferable for the molecular weight of the cationic polymer to be 100,000 or greater and 1,500,000 or less.

[0021]

It is preferable for the nitrogen content in the cationic polymer to be within a range from 1.0% to 2.5%.

It is particularly preferable for a quaternary nitrogen containing cellulose ether derivative, a quaternary nitrogen containing starch, a quaternary nitrogen containing

guar gum, vinyl pyrrolidone/N, N-dimethyl amino ethyl methacrylic acid copolymer diethyl sulfate to be employed, from among cationic polymers having a nitrogen content within a range from 1.0% to 2.5%.

[0022]

- 5 The content of the cationic polymer within the gel composition for hair is, for example, 0.3% by mass or greater with respect to 100% by mass of the gel composition for hair, and is selected such that a cationic polymer/anionic polymer ratio to be described later becomes 0.17 or greater and 1.80 or less.

[0023]

- 10 (Ratio of Cationic Polymer with Respect to Anionic Polymer)

 The cationic polymer/anionic polymer ratio, which is the ratio of the cationic polymer with respect to the anionic polymer in the gel composition for hair, is 0.17 or greater and 1.80 or less. By the cationic polymer/anionic polymer ratio being 0.17 or greater, setting performance and glossiness can be obtained. By the polymer/anionic
15 polymer ratio being 1.80 or less, when the composition is taken into the palm of a hand and spread, a sensation that the agent is crumbling on the hands can be obtained, a superior sense of freshness can be obtained, and a sensation of stickiness can be suppressed.

[0024]

- 20 (pH of Gel Composition for Hair)

 The pH of the gel composition for hair of the present invention is 5.50 or greater and 8.20 or less at a temperature of 25°C, from the viewpoints of obtaining a transparent gel and a sensation of freshness. Note that the pH of the gel composition for hair may be measured by a known method, employing a pH meter or the like.

- 25 [0025]

(pH Adjusting Agent)

- The pH of the gel composition for hair of the present invention at a temperature of 25° C is adjusted by a pH adjusting agent. An alkali to be employed as the pH adjusting agent is not particularly limited, but potassium hydroxide, sodium hydroxide,
30 triethanol amine, amino methyl propanol (AMP), amino methyl propane diol may be favorably employed. Amino methyl propanol (AMP) is more preferable.

[0026]

(Viscosity of Gel Composition for Hair)

The viscosity of the gel composition for hair is 1.0 times or greater and less than 8.0 times the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized, preferably 6 times or less, and still more preferably 2 times or less. By viscosity of the gel composition for hair being 1.0 times or greater the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized, elasticity of the gel can be obtained. By the viscosity of the gel composition for hair being less than 8.0 times the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized, a sensation of freshness can be obtained. The ratio of the viscosity of the gel composition for hair with respect to the viscosity of the anionic polymer is a ratio of the viscosity of the composition containing the cationic polymer with respect to the viscosity of the anionic polymer alone. Note that in the case that this ratio is 8.0 times or greater, the amount of water contained within complexes will increase, and the stability of the composition will deteriorate.

It is preferable for the viscosity of the gel composition for hair to be 12000 mPa·s or greater and 170000 mPa·s or less, more preferably 12000 mPa·s or greater and 160000 mPa·s or less, and still more preferably 12000 mPa·s or greater and 60000 mPa·s or less. By the viscosity of the gel composition for hair being 12000 mPa·s or greater, elasticity of the gel can be obtained. By the viscosity of the gel composition for hair being 170000 mPa·s or less, a sensation of freshness can be obtained.

Note that there may be cases in which the viscosity of the gel composition for hair is selected according to the mechanism of a container.

[0027]

By the gel composition for hair of the present invention further containing a nonionic polymer and/or an amphoteric polymer, it is possible to improve setting performance while suppressing a sensation of stickiness on the hand. In the case that nonionic polymer or an amphoteric polymer is added to a composition for hair that contains only an anionic polymer as a polymer, for example, although setting performance will be improved, a sensation of stickiness will be generated.

[0028]

(Nonionic Polymer, Amphoteric Polymer)

Examples of the nonionic polymer include: polyvinyl pyrrolidone (Lubiskol K17, Lubiskol K30, and Lubiskol K90 by BASF), PVP K (by ISP Japan), a vinyl pyrrolidone · vinyl acetate copolymer (PVP/VA S-630, PVP/VA E-735, and PVP/VA E-335 by ISP Japan), Lubiscol VA 73W, Lubiscol 37E, (by BASF), PVA-6450 (by Osaka Organic Chemical Industry), a vinyl methyl ether · maleate alkyl copolymer (GANTREZ A-425, GANTREZ ES-225, and GANTREZ ES-335 (all by ISP Japan), a vinyl pyrrolidone · methacryl amide · vinyl imidazole copolymer (Ruby Set Clear by BASF), etc., as nonionic polymers.

[0029]

Examples of the amphoteric polymer include: an octyl acrylate amide·hydroxypropyl propyl acrylate · butylaminoethyl methacrylate copolymer (AMPHOMER SH 30 and AMPHOMER LV-71 by Nippon NSC), a methacryloyl oxyethyl carboxy betaine·alkyl methacrylate copolymer (YUKAFORMER R205, YUKAFORMER 301, YUKAFORMER SM, and YUKAFORMER 104D by Mitsubishi Chemicals), RAM Resin-1000, RAM Resin-2000, RAM Resin-3000, and RAM Resin-4000 (by Osaka Organic Chemical Industry), a dimethyl diallyl ammonium chloride·acrylic acid copolymer (Merquat 280 and Merquat 295 by Nalco), a dimethyl diallyl ammonium chloride·acryl amide acrylic acid copolymer (Merquat Plus 3330 and Merquat Plus 3331 by Nalco), etc.

[0030]

(Other Components)

The gel composition of the present invention may contain, within a range that will not adversely influence the advantageous effects of the present invention, a solubilizing agent (ethanol, isopropanol, butanol, etc.), a polyhydric alcohol (ethylene glycol, polyethylene glycol, propylene glycol, dipropylene glycol, polypropylene glycol, 1,3-butylene glycol, glycerin, diglycerin, isoprene glycol etc.), a polymer such as a saccharide (sorbitol, maltitol, xylitol, glucose, fructose, mannitol, inositol, etc.) a high molecular species such as hyaluronic acid, an antioxidant, an ultraviolet ray absorbing agent, a preservative, a chelating agent, a perfume, a coloring agent, a thickening agent, a metal sequestering agent (edetate salt, etc.), and a pH adjusting agent.

[0031]

The gel composition for hair of the present invention may be employed as a

base material for a cosmetic for hair. For example, the gel composition for hair of the present invention may be employed as a base material for a hair treatment and a styling agent.

[0032]

5 (Production Method)

The gel composition for hair of the present invention may be produced as follows, for example.

A cationic polymer and an alkali (pH adjusting agent) are added to water, the aqueous solution is purified, and an anionic polymer is added thereafter. Note that
10 during the addition of the anionic polymer, it is preferable to perform the additions while stirring the aqueous solution as necessary.

[Examples]

[0033]

Hereinafter, the present invention will be described in further detail with
15 reference to the Examples. However, the present invention is not limited to these Examples.

[0034]

Gel compositions for hair were prepared according to the formulae shown in Table 1 through Table 8, by the following procedures.

20 (Preparation Method)

A cationic polymer was added to purified water and mixed to produce an aqueous solution of the cationic polymer. Next, a neutralizing agent was added to the aqueous solution. Note that the neutralizing agent was added to the aqueous solution while stirring, as necessary. Lastly, an anionic polymer was added to the aqueous
25 solution of the cationic polymer, to obtain a gel composition for hair. The viscosity of the composition did not change over time, and exhibited superior stability.

[0035]

[Examples 1 through 3; Comparative Examples 1 through 7]

Gel compositions for hair, in which the type of the anionic polymer was
30 changed as appropriate, were produced. The pH of the gel compositions for hair was adjusted by a pH adjusting agent to be within a range from 6 to 6.5. The formulae and the results of evaluations are shown in Table 1.

[0036]

[Examples 4 through 6; Comparative Examples 8 through 10]

5 Gel compositions for hair, in which the content of the anionic polymer was set constant while the content of the cationic polymer was changed such that the cationic polymer/anionic polymer ratios became different, were produced. The pH of the gel compositions for hair was adjusted by a pH adjusting agent to be within a range from 6 to 6.5. The formulae and the results of evaluations are shown in Table 2.

[0037]

[Examples 7 through 17; Comparative Examples 11 through 21]

10 Gel compositions for hair, in which the content of the anionic polymer and the content of the cationic polymer were changed such that the cationic polymer/anionic polymer ratios became different, were produced. The pH of the gel compositions for hair was adjusted by a pH adjusting agent to be within a range from 6 to 6.5. The formulae and the results of evaluations are shown in Table 3, Table 4, and Table 5.

15 [0038]

[Examples 18 through 24; and Comparative Examples 22 through 27]

20 The contents of the cationic polymer and the anionic polymer were set constant to fix the content ratio of the cationic polymer/anionic polymer, and gel compositions for hair having different pH's were produced by employing pH adjusting agents. The preparations and evaluation results are shown in Table 6 and Table 7.

[0039]

[Examples 25 through 28; and Comparative Examples 28 and 29]

25 Cationic polymers having different nitrogen contents were employed. The preparations and the results of evaluations are shown in Table 8.

[0040]

The evaluation test methods and evaluation standards for the Examples and Comparative Examples are as follows.

[0041]

<Measurement of Viscosity>

30 Viscosities (mPa·s) at a temperature of 30°C were measured by a Vismetron viscometer (BH type, by Shibaura Systems) under conditions in which a Number 6 spindle was employed at a rotational speed of 10 rpm.

<Ease of Crumbling of Agent>

A utilization test was conducted by a panel of ten experts. Sensory evaluations were conducted regarding the ease with which base agents crumbled when taken up by their hands, based on the following evaluation point standards. The totals of the evaluation points were scored based on the following evaluation standards. Evaluation scores of B or greater were judged as being easy to crumble.

[0042]

(Evaluation Point Standards)

5 points: Easy to crumble

4 points: Somewhat easy to crumble

3 points: Slightly easy to crumble

2 points: Somewhat uneasy to crumble

0 points: Difficult to crumble

[0043]

(Evaluation Standards)

A: Total score of 40 points or greater

B: Total score of 30 points or greater

C: Total score of 20 points or greater and less than 30 points

D: Total score of 10 points or greater and less than 20 points

E: Total score of less than 10 points

[0044]

<Sensation of Freshness on Hands (Lack of Stickiness)>

A utilization test was conducted by a panel of ten experts. Sensory evaluations were conducted regarding the sensation of freshness of base agents when taken up by their hands, based on the following evaluation point standards. The totals of the evaluation points were scored based on the following evaluation standards. Evaluation scores of B or greater were judged as imparting a sensation of freshness.

[0045]

(Evaluation Point Standards)

5 points: Imparts a sensation of freshness

4 points: Somewhat imparts a sensation of freshness

3 points: Slightly imparts a sensation of freshness

2 points: Somewhat does not impart a sensation of freshness

0 point: Does not impart a sensation of freshness

[0046]

(Evaluation Standards)

- 5 A: Total score of 40 points or greater
 B: Total score of 25 points or greater and less than 40 points
 C: Total score of 10 points or greater and less than 25 points
 D: Total score of less than 10 points

[0047]

10 <Ease of Application to Hair>

A utilization test was conducted by a panel of ten experts. Sensory evaluations were conducted regarding the ease of application to hair of base agents when taken up by their hands and applied to their hair, based on the following evaluation point standards. The totals of the evaluation points were scored based on the following evaluation standards. Evaluation scores of B or greater were judged as exhibiting ease of application to hair.

[0048]

(Evaluation Point Standards)

5 points: Easy to apply to hair

20 4 points: Somewhat easy to apply to hair

3 points: Slightly easy to apply to hair

2 points: Somewhat difficult to apply to hair

0 points: Difficult to apply to hair

[0049]

25 (Evaluation Standards)

- A: Total score of 40 points or greater
B: Total score of 25 points or greater and less than 40 points
C: Total score of 10 points or greater and less than 25 points

[0050]

30 <Glossiness>

A utilization test was conducted by a panel of ten experts. Sensory evaluations were conducted regarding glossiness of base agents after being applied to

their hair, based on the following evaluation point standards. The totals of the evaluation points were scored based on the following evaluation standards. Evaluation scores of C or greater were judged as exhibiting glossiness.

[0051]

5 (Evaluation Point Standards)

5 points:Glossy

4 points:Somewhat glossy

3 points:Slightly glossy

2 points:Somewhat not glossy

10 0 points:Not glossy

[0052]

(Evaluation Standards)

A: Total score of 40 points or greater

B: Total score of 25 points or greater and less than 40 points

15 C: Total score of 10 points or greater and less than 25 points

D: Total score of less than 10 points

[0053]

<Setting Performance>

20 A utilization test was conducted by a panel of ten experts. Sensory evaluations were conducted regarding the setting performance of base after application to their hair based on the following evaluation point standards. The totals of the evaluation points were scored based on the following evaluation standards. Evaluation scores of C or greater were judged as exhibiting setting performance.

[0054]

25 (Evaluation Point Standards)

5 points:Has setting performance

4 points:Somewhat has setting performance

3 points:Slightly has setting performance

2 points:Somewhat does not have setting performance

30 0 points:Does not have setting performance

[0055]

(Evaluation Standards)

- A: Total score of 40 points or greater
- B: Total score of 25 points or greater and less than 40 points
- C: Total score of 10 points or greater and less than 25 points
- D: Total score of less than 10 points

5 [0056]

<External Appearance (Transparency)>

The external appearance (transparency) of each sample was evaluated by visual observation. Evaluation scores of B or greater were judged as exhibiting transparency.

[0057]

10 (Evaluation Standards)

- A: Very transparent
- B: Somewhat transparent
- C: Somewhat cloudy
- D: Very cloudy

15 [0058]

<Stability Over Time>

Each sample was evaluated according to the (External Appearance Evaluation Standards) and (Viscosity Evaluation Standards) below. Evaluation scores of B or greater were judged as exhibiting stability over time.

20 (External Appearance Evaluation Standards)

The external appearance of each sample was evaluated by visual observation. Evaluation scores of B or greater were judged as exhibiting transparency.

- A: Very transparent
- B: Somewhat transparent
- 25 C: Somewhat cloudy
- D: Very cloudy

[0059]

(Viscosity Evaluation Standards)

30 Viscosity was evaluated by comparing the viscosity of each sample immediately after production and after each sample was stored for one month at 50°C.

Viscosity Ratio = Viscosity (Stored for One Month at 50°C)/(Viscosity Immediately After Production)

A: Viscosity Ratio of 0.5 or greater and less than 1.5

B: Viscosity Ratio of 0.25 or greater and less than 0.5 or 1.5 or greater and less than 2

C: Viscosity Ratio outside the ranges of A and B

5 [0060]

<Stability Over Time Evaluation Standards>

A: Cases in which external appearance evaluation is A or B and viscosity evaluation is A

10 B: Cases in which external appearance evaluation is B and viscosity evaluation is B, or external appearance evaluation is C and viscosity evaluation is A

C: Cases other than A or B

[0061]

Table 1 through Table 8 are shown below.

[0062]

[Table 1]

		Units	Comparative Example 1	Example 1	Comparative Example 2	Example 2	Comparative Example 3	Example 3	Comparative Example 4	Comparative Example 5	Comparative Example 6	Comparative Example 7	
Composition	Ion Exchanged Water	mass %	99.4	99.05	99.35	99	99.3	98.95	99.68	99.33	99.92	99.8325	
	Cationic Polymer	mass %	-	0.35	-	0.35	-	0.35	-	0.35	-	0.0875	
	Product Name: H. C. Polymer 1S (M)												
	Anionic Polymer	(Acrylate/Acrylic Acid Alkyl (C10-30) Cross Polymer	mass %	0.4	0.4	-	-	-	-	-	-	-	-
		Product Name: PEMULEN TR-1											
		(Acrylate/Acrylic Acid Alkyl (C10-30) Cross Polymer	mass %	-	-	0.4	0.4	-	-	0.2	0.2	-	-
	Product Name: PEMULEN TR-2												
	Carbomer	mass %	-	-	-	-	0.4	0.4	-	-	-	0.05	0.05
	Product Name: CARBOPOL 981												
	pH Adjusting Agent	AMP	mass %	0.2	0.2	0.25	0.25	0.3	0.3	0.12	0.12	0.03	0.03
	Product Name: AMP-ULTRA PC1000												
	(Cationic Polymer/Anionic Polymer) Ratio												
Viscosity		mPa·s	22900	42000	4000	22000	8600	11200	800	8020	1540	2240	
Viscosity Ratio (with respect to anionic polymer alone)			1	1.83	1	5.50	1	1.30	1	10.03	1	1.45	
Ease of Crumbling of Agent			C	A	C	A	C	B	C	A	C	C	
Freshness on Hands (lack of stickiness)			B	A	B	A	B	B	A	A	A	A	
Ease of Application to Hair			B	B	D	B	C	A	B	B	B	B	
Glossiness			C	A	C	A	C	A	D	B	D	C	
Stability over Time			A	A	A	B	A	A	A	C	A	B	

[0063]

[Table 2]

Composition	Units	Comparative Example 1	Example 4	Example 5	Example 1	Example 6	Comparative Example 8	Comparative Example 9	Comparative Example 10
Ion Exchanged Water	mass %	99.4	99.33	99.225	99.05	98.7	98	97.3	96.6
Cationic Polymer	mass %	-	0.07	0.175	0.35	0.7	1.4	2.1	2.8
Product Name: H. C. Polymer 1S (M)									
Anionic Polymer	mass %	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
(Acrylate/Acrylic Acid Alkyl (C10-30) Cross Polymer Product Name: PEMULEN TR-1									
pH Adjusting Agent	mass %	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
AMP Product Name: AMP-ULTRA PC1000									
(Cationic Polymer/Anionic Polymer) Ratio									
Viscosity	mPa·s	22900	33600	37600	42000	30500	15000	5400	7000
Viscosity Ratio (with respect to anionic polymer alone)		1	1.47	1.64	1.83	1.33	0.66	0.24	0.31
Ease of Crumbling of Agent		C	A	A	A	A	C	C	C
Freshness on Hands (lack of stickiness)		B	A	A	A	A	B	B	B
Ease of Application to Hair		B	B	B	B	B	C	D	D
Glossiness		C	B	B	A	A	A	A	A
Stability over Time		A	A	A	A	A	B	C	C

[0064]

[Table 3]

Composition			Units	Comparative Example 11	Example 7	Example 8	Comparative Example 12	Example 9	Example 10	Example 11
Composition	Ion Exchanged Water		mass %	99.7	99.525	99.35	99.55	99.4975	99.2875	99.025
	Cationic Polymer	Polyquaternium-11 Product Name: H. C. Polymer 1S (M)	mass %	-	0.175	0.35	-	0.0525	0.2625	0.525
	Anionic Polymer	(Acrylate/Acrylic Acid Alkyl (C10-30) Cross Polymer Product Name: PEMULEN TR-1	mass %	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	pH Adjusting Agent	AMP Product Name: AMP-ULTRA PC1000	mass %	0.1	0.1	0.1	0.15	0.15	0.15	0.15
	(Cationic Polymer/Anionic Polymer) Ratio			0	0.875	1.75	0	0.175	0.875	1.75
Evaluations	Viscosity		mPa • s	11300	13400	12400	14900	17400	18500	27300
	Viscosity Ratio (with respect to anionic polymer alone)			1.00	1.19	1.10	1.00	1.17	1.24	1.83
	Ease of Crumbling of Agent			B	A	A	B	A	A	A
	Freshness on Hands (lack of stickiness)			A	A	A	B	A	A	A
	Ease of Application to Hair			D	B	B	D	B	B	B
	Setting Performance			D	C	B	C	B	B	B

[0065]

[Table 4]

		Units	Comparative Example 1	Example 12	Example 13	Example 14	Comparative Example 13	Example 15	Example 16	Example 17	
Composition	Ion Exchanged Water		mass %	99.4	99.33	99.05	98.7	98.8	98.66	98.1	97.4
	Cationic Polymer	Polyquaternium-11 Product Name: H. C. Polymer 1S (M)	mass %	-	0.07	0.35	0.7	-	0.14	0.7	1.4
	Anionic Polymer	(Acrylate/Acrylic Acid Alkyl (C10-30) Cross Polymer Product Name: PEMULEN TR-1	mass %	0.4	0.4	0.4	0.4	0.8	0.8	0.8	0.8
	pH Adjusting Agent	AMP Product Name: AMP-JULTRA PC1000	mass %	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4
	(Cationic Polymer/Anionic Polymer) Ratio			0	0.175	0.875	1.75	0	0.175	0.875	1.75
	Viscosity		mPa·s	22900	30500	40000	44900	26600	83200	131600	156400
	Viscosity Ratio (with respect to anionic polymer alone)			1.00	1.33	1.75	1.96	1.00	3.13	4.95	5.88
	Ease of Crumbling of Agent			C	A	A	A	C	B	B	B
	Freshness on Hands (lack of stickiness)			B	A	A	A	C	B	B	B
	Ease of Application to Hair			B	B	B	B	C	B	B	B
Evaluations	Setting Performance			C	B	B	B	B	B	B	A

[0066]

[Table 5]

	Units	Comparative Example									
		14	15	16	17	18	19	20	21	22	23
Composition	Ion Exchanged Water	99.85	99.8325	99.7625	99.675	98.5	98.325	97.625	96.75		
	Cationic Polymer	-	0.0175	0.0875	0.175	-	0.175	0.875	1.75		
	Anionic Polymer	0.1	0.1	0.1	0.1	1	1	1	1		
	pH Adjusting Agent	0.05	0.05	0.05	0.05	0.5	0.5	0.5	0.5		
	(Cationic Polymer/Anionic Polymer) Ratio	0	0.175	0.875	1.75	0	0.175	0.875	1.75		
	Viscosity	7300	10100	6810	4780	31000	125600	174400	226800		
	Viscosity Ratio (with respect to anionic polymer alone)	1	1.38	0.93	0.65	1	4.05	5.63	7.32		
	Ease of Crumbling of Agent	B	A	A	A	C	C	C	C		
	Freshness on Hands (lack of stickiness)	B	A	A	A	C	D	D	D		
	Ease of Application to Hair	D	D	D	D	C	C	C	D		
Evaluations	Setting Performance	D	D	D	C	B	A	A	A		

[0067]

[Table 6]

Composition		Units	Example 18	Example 19	Example 20	Example 1	Example 21	Example 22
Ion Exchanged Water		mass %	99.13	99.1	99.07	99.05	98.95	98.9
Cationic Polymer	Polyquaternium-11	mass %	0.35	0.35	0.35	0.35	0.35	0.35
	Product Name: H. C. Polymer 1S (M)							
Anionic Polymer	(Acrylate/Acrylic Acid Alkyl (C10-30) Cross Polymer	mass %	0.4	0.4	0.4	0.4	0.4	0.4
	Product Name: PEMULEN TR-2							
pH Adjusting Agent	AMP	mass %	0.12	0.15	0.18	0.2	0.3	0.35
Product Name: AMP-ULTRA PC1000								
pH			5.50	5.61	5.86	6.26	6.59	7.08
Viscosity		mPa·s	89100	84800	45600	42000	42200	40200
Viscosity Ratio (with respect to anionic polymer alone)			4.23	4.12	2.02	1.83	1.84	1.78
Ease of Crumbling of Agent			B	B	A	A	A	A
Freshness on Hands (lack of stickiness)			B	B	A	A	A	A
Ease of Application to Hair			B	B	B	B	B	B
External Appearance (Transparency)			A	A	A	A	A	A
Stability over Time			B	B	A	A	A	A

[0068]

[Table 7]

Composition										Evaluations												
		Units	Example 23	Example 24	Comparative Example 22	Comparative Example 23	Comparative Example 24	Comparative Example 25	Comparative Example 26	Comparative Example 27												
Ion Exchanged Water		mass %	98.85	98.8	99.15	99.25	99.2	98.75	98.45	98.25												
	Cationic Polymer	mass %	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35												
	Product Name: H. C. Polymer 1S (M)																					
	Anionic Polymer	mass %	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4												
	(Acrylate/Acrylic Acid Alkyl (C10-30) Cross Polymer																					
	Product Name: PEMULEN TR-2																					
	pH Adjusting Agent	mass %	0.4	0.45	0.1	-	0.05	0.5	0.8	1												
	Product Name: AMP-ULTRA PC1000																					
	pH		7.36	8.12	5.10	3.63	4.80	9.18	10.23	10.42												
	Viscosity	mPa · s	39800	37300	70000	Separated	40800	25500	25000	25600												
Viscosity Ratio (with respect to anionic polymer alone)																						
Ease of Crumbling of Agent																						
Freshness on Hands (lack of stickiness)																						
Ease of Application to Hair																						
External Appearance (Transparency)																						
Stability over Time																						

[0069]

[Table 8]

Composition	Units	Comparative Example 1	Example 1	Example 25	Example 26	Example 27	Example 28	Comparative Example 28	Comparative Example 29
		Example 1	Example 1	Example 25	Example 26	Example 27	Example 28	Comparative Example 28	Comparative Example 29
Composition	Ion Exchanged Water	99.4	99.05	99.05	98.9	99.3	99.2	99.1	98.75
	Polyquaternium-11	0	0.35	-	-	-	-	-	-
	Product Name: H. C. Polymer 1S (M)	-	-	0.35	-	-	-	-	-
	Polyquaternium-11	-	-	-	-	-	-	-	-
	Product Name: H. C. Polymer 1N	-	-	-	-	0.1	-	-	-
	Polyquaternium-19	-	-	-	0.5	-	-	-	-
	Product Name: Polymer JR 400	-	-	-	-	-	-	-	-
	Guar Hydroxy Propyl Trimonium Chloride	-	-	-	-	-	-	-	-
	Product Name: Rhaball Gum CG-M	-	-	-	-	-	-	-	-
	Hydroxy Propyl Trimonium Chloride Starch	-	-	-	-	-	0.2	-	-
	Product Name: Sensomer CI-50 polymer	-	-	-	-	-	-	-	-
	Polyacrylate-1	-	-	-	-	-	-	0.15	-
	Product Name: COSQUAT GA 468	-	-	-	-	-	-	-	-
Anionic Polymer	Polyquaternium-7	-	-	-	-	-	-	-	0.5
	Product Name: Merquat 550L	-	-	-	-	-	-	-	-
	(Acrylate/Acrylic Acid Alkyl	-	-	-	-	-	-	-	-
	(CI0-30) Cross Polymer	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Product Name: PEMULEN TR-1	-	-	-	-	-	-	-	-
pH Adjusting Agent	AMP	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Product Name: AMP-ULTRA PC1000	-	-	-	-	-	-	-	-
	Phosphoric Acid	-	-	-	-	-	-	0.15	0.15
(Cationic Polymer/Anionic Polymer) Ratio	Grade	-	-	-	-	-	-	-	-
	pH	0	0.875	0.875	1.25	0.25	0.5	0.375	1.25
	Viscosity	6.32	6.26	6.29	6.01	6.21	5.84	5.82	5.64
Evaluations	Viscosity Ratio (with respect to anionic polymer alone)	22900	42000	48000	29600	31300	27700	Separated	Separated
	Ease of Crumbling of Agent	1	1.83	2.10	1.29	1.37	1.21	-	-
	Freshness on Hands (lack of stickiness)	C	A	A	B	B	B	-	-
Ease of Application to Hair		B	A	B	A	A	A	-	-
		B	B	B	B	B	B	-	-

[0070]

The details of the materials in Table 1 through Table 8 above are as follows.

(Cationic Polymer)

- Product Name “H. C. Polymer 1S (M)” (by Osaka Organic Chemical Industry)
- 5 • Product Name “H. C. Polymer 1N” (by Osaka Organic Chemical Industry)
- Product Name “Polymer JR- 400” (by Union Carbide)
- Product Name “Rhaball Gum CG-M” (by DSP Gokyo Food & Chemical)
- Product Name “Sensomer CI-50 Polymer” (by Lubrizol Advanced Materials)
- Product Name “COSQUAT GA468” (by Osaka Organic Chemical Industry)
- 10 • Product Name “Merquat 550L” (by Lubrizol Advanced Materials)

[0071]

(Anionic Polymer)

- Product Name “PEMULEN TR-1” (by Lubrizol Advanced Materials)
- Product Name “PEMULEN TR-2” (by Lubrizol Advanced Materials)
- 15 • Product Name “CARBOPOL 981” (by Lubrizol Advanced Materials)

[0072]

(Neutralizing agent)

- Product Name “AMP-ULTRA PC1000” (by ANGUS Chemical Company)
- Product Name “Phosphoric Acid Kokusan First Grade” (by Kokusan Chemical)

20 [0073]

As shown in Tables 1 and 2, it can be understood that the gel compositions for hair of the present invention exhibit ease of crumbling, a sensation of freshness on the hand, and ease of application to hair, while also exhibiting superior stability over time, without loss of setting performance. Each of Comparative Examples 1, 2, 3, 4, and 6 are gel compositions for hair containing an anionic polymer alone. Because these Comparative Examples do not have complexes present therein, ease of crumbling of the agents was not felt, and the sensation of use was poor. Particularly in the case that viscosity is low as in Comparative Examples 4 and 6 (the viscosity in the table is only that of the anionic polymer alone, because these Comparative Examples do not contain a cationic polymer), ease of crumbling of the agents was not felt, glossiness was also not obtained, and the sensation of use was poor. In addition, even if the cationic polymer/anionic polymer ratio and the viscosity are within predetermined ranges, those

having great viscosity ratios had a large amount of water held within the complexes, resulting in poor stability as indicated by Comparative Example 5.

[0074]

From Table 3 through Table 5, it can be seen that even if the cationic
5 polymer/anionic polymer ratio was 0.17 or greater and 1.80 or less, ease of application to hair was poor if the anionic polymer content was less than 0.2% by mass, and that the ease with which the agents crumbled and the sensation of freshness on the hands were also poor if the content of the anionic polymer was 1.0% by mass or greater. It can be understood that the gel compositions for hair of the present invention exhibited superior
10 ease of crumbling of the agents, sensation of freshness on the hands, and ease of application to hair compared to the gel compositions for hair of the Comparative Examples.

In addition, it can be understood from Table 6 and Table 7 that transparency was poor if the pH is less than 5.50, and that the ease with which the agents crumble
15 was poor if the pH exceeded 8.20.

Further, it can be understood from Table 8 that the gel compositions for hair of the present invention may be applied with cationic polymers having different nitrogen contents.

CLAIMS

[Claim 1] A gel composition for hair, comprising:

(A) an anionic polymer;

(B) a cationic polymer; and

5 (C) water;

the content of the anionic polymer (A) being 0.2% by mass or greater and less than 1.0% by mass with respect to 100% by mass of the gel composition for hair;

the ratio of the cationic polymer (B) with respect to the anionic polymer (A) being 0.17 or greater and 1.80 or less;

10 the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized being 1550 mPa·s or greater and 170000 mPa·s or less;

the viscosity of the gel composition for hair is greater than 1.0 times and less than 8.0 times the viscosity in a state in which only the anionic polymer (A) is dissolved or dispersed in the water (C) and is neutralized; and

15 the pH at 25°C is 5.50 or greater and 8.20 or less.

[Claim 2] A gel composition for hair as defined in Claim 1, wherein:

the cationic polymer (B) is at least one species selected from among: vinyl pyrrolidone · N, N-dimethyl amino ethyl methacrylic acid copolymer diethyl sulfate, O-
20 [2-hydroxy-3- (trimethyl ammonio) propyl] hydroxyethyl cellulose chloride, O- [2-hydroxy-3- (trimethyl ammonio) propyl guar gum chloride, and hydroxy propyl trimonium chloride starch.

[Claim 3] A gel composition as defined in either one of Claim 1 and Claim 2, wherein:

25 the anionic polymer (A) is a carboxyl group containing water soluble polymer.

[Claim 4] A gel composition for hair as defined in Claim 3, wherein:

the carboxyl group containing water soluble polymer is an acrylic acid methacrylic acid alkyl ester copolymer.

[Claim 5] A gel composition for hair as defined in any one of Claims 1 through
30 4, wherein:

the content of cationized nitrogen in the cationic polymer (B) is within a range from 1.0 to 2.5%.

[Claim 6] A gel composition for hair as defined in any one of Claims 1 through 5, wherein:

the viscosity of the gel composition for hair is 12000 mPa·s or greater and 170000 mPa·s or less.

5 [Claim 7] A gel composition for hair as defined in any one of Claims 1 through 6, wherein:

the content of the anionic polymer (A) is 0.3% by mass or greater and 0.8% by mass or less with respect to 100% by mass of the gel composition for hair.

10