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Use of a hair cosmetic composition for preventing generation of split hair or torn hair and for repairing damaged hair.

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1. Field of the Invention

The present invention relates to the use of a hair cosmetic composition giving an excellent luster to the hair, having a good set retentive force, imparting a smooth feeling to the hair, for preventing the generation of split hair and torn hair, and for repairing hair.

Generally speaking, when complicated beauty treatments involving hair washing, brushing, heating by a dryer, hair coloring, bleaching agents, etc., are applied repeatedly to the hair, the hair will be extensively damaged and deteriorated and, consequently, becomes dry and unkempt, or an increased splitting of hair or of torn hair and a lowering in strength occur, as is well known in the art.

Accordingly, to alleviate such hair damage as described above, and to protect and repair hair, oil components such as silicone oil, ester oil, hydrocarbon oil, etc. have been used as solubilized or dissolved as the base in hair cosmetics to give a luster and smoothness to the hair. Particularly, silicone oil having a degree of polymerization of 3 to 650 has a low surface tension and an excellent compatibility with hair to give a good luster thereto, and therefore, has been frequently used recently. However, the oil component is limited, and if used in a large amount or used over a long period, a drawback arises in that the hair becomes fatty. Also, cationic surfactants have been frequently used for imparting smoothness, but a desirable luster cannot be given thereby, and a drawback arises in an absence of undesirable side effects cannot be guaranteed when these surfactants are formulated in a large amount. EP-A-155806 discloses a hair conditioning composition containing as essential ingredients (a) a silicone conditioning agent, preferably a linear polydimethylsiloxane of the formula:

\[(\text{CH}_2\text{O})_n\text{SiO}((\text{CH}_3)_2\text{O})_m\text{Si(CH}_3)_3\]

where \(n\) is from 1 to 15000, preferably from 20 to 7000, and unsubstituted or substituted by vinyl, phenyl, carboxyl, alkoxy, mercapto, alkyl or amino, (b) a dimethicone copolyol, (c) a lipid vehicle material, (d) a cationic surfactant vehicle material and (e) water. These compositions are said to have improved hair-care benefits while maintaining excellent in-use characteristics, in particular to exhibit lower recoiling of hair after use. No mention is made, however, of preventing generation of split or torn hair or of repairing damaged hair.

Also, for hair setting polymeric compounds, such as polyvinyl pyrrolidone type polymers, acidic polyvinyl ether type polymers, acidic acrylic polymers or cationic polymers, etc. have been employed. Although these gave an excellent fixing, namely hair setting power, they did not give a satisfactory luster and smoothness, and had a drawback of hardening the hair, i.e., making it stiff.

Starting materials extracted from natural products had some effects in hair damage prevention and protection from chemical or mechanical treatments, but none were satisfactory because, for example, the adhesiveness to the hair was weak or a feeling such as smoothness after use was unsatisfactory.

The present invention seeks to provide a means for preventing the generation of split hair or torn hair, and of repairing hair, preferably employing a hair cosmetic composition which gives an excellent luster, imparts a smooth feeling to the hair without fattiness and stiffness.

Other advantages of the present invention will be apparent from the following description.

In accordance with the present invention, there is provided the use for preventing the generation of split hair or torn hair and for repairing damaged hair of a hair cosmetic composition comprising at least one high molecular weight silicone having the formula (I):

\[
\begin{array}{c}
\text{R}_1 \\
\text{R}_2 - \text{SiO} - \text{SiO} \\
\text{Si}\text{R}_1 \\
\text{R}_1 \\
\end{array}
\]

(I)

where each \(\text{R}_1\) represents methyl or one or more of the \(\text{R}_2\); represents phenyl and the remainder represent methyl, each \(\text{R}_2\) represents methyl or hydroxy, and \(n\) represents an integer of 3000 to 20000, said composition being free of any dimethicone copolyol. The invention also includes the use of such a silicone
for the production of such a hair cosmetic composition.

For the use in accordance with the present invention, there are provided various preferred hair cosmetic compositions containing, as an essential component, the above-mentioned high molecular weight silicone (I) and other components as follows:

(1)
(A) 0.1% to 25% by weight of the above-mentioned high molecular weight silicone (I);
(B) 1% to 99.9% by weight of at least one cyclic silicone; and
(C) 1% to 99.9% by weight of trichlorotrifluoroethane and/or tetrachlorodifluoroethane;
(2)
(A) 0.1% to 25% by weight of the above-mentioned high molecular weight silicone (I):
(B) 45% to 99.9% by weight of at least one cyclic silicone; and
(C) 1% to 30% by weight of at least one lower alcohol;
(3)
(A) 0.01% to 25% by weight of the above-mentioned high molecular weight silicone (I):
(B) 1% to 99.9% by weight of trichlorotrifluoroethane and/or tetrachlorodifluoroethane; and
(C) 5% to 95% by weight of an aerosol propellant.

The high molecular weight silicone (I) usable for the present invention has a high molecular weight and the value of n in the formula (I) is 3000 to 20000. The molecular weight is about 370000 to 1500000, and soft rubbery properties are exhibited at normal temperature.

Typical examples of such silicones are dimethyldipolysiloxane, methylphenylpolysiloxane, dimethylpolysiloxane containing terminal hydroxyl groups, and methylphenylpolysiloxane containing terminal hydroxyl groups.

The use of the high molecular weight silicone according to the invention prevents and repairs damage such as split hair and torn hair by coating the damaged portion of the hair surface with a thin film of a high molecular weight silicone.

The amount of the high molecular weight silicone formulated may be 0.1% to 50% by weight, preferably 1% to 30% by weight, in the total amount of the cosmetic composition. When the amount is less than 0.1% by weight, a satisfactory effect will not be obtained. When the amount exceeds 50% by weight, solubility is achieved only with difficulty.

The high molecular weight silicone is formulated in a hair cosmetic composition, preferably by dissolving in a volatile or a low boiling-point oil, or it may be formulated separately into the hair cosmetic compositions and dissolved in the system.

Examples of the low boiling-point oil include low boiling-point linear silicones, low boiling-point cyclic silicones and low boiling-point isoparaffinic hydrocarbons.

The low boiling-point linear silicone is represented by the formula:

\[
\begin{array}{c}
\text{CH}_3 \\
\text{SiO} \\
\text{SiO} \\
\text{Si} \\
\text{CH}_3 \\
\end{array}
\]

where m represents 0 or an integer of 1 to 5. Specific examples thereof include hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane and hexadecamethylheptasiloxane.

The low boiling-point cyclic silicone is represented by the formula:

\[
\begin{array}{c}
\end{array}
\]

where m' represents an integer of 3 to 7. Specific examples thereof include octamethylcyclotetrasiloxane, decamethylcyclopentasiloxane and tetratodecamethycyclotetrasiloxane.

The low boiling-point isoparaffinic hydrocarbon may be an isoparaffinic hydrocarbon with boiling points at normal pressure in the range of from 60 °C to 260 °C, as exemplified by Isopar (trademark) A, C, D, E, G, H, K, L, M produced by Exxon Co., Shell sol 71 (trademark) produced by Shell Co., Soltol (trademark) 100,
130 or 220 produced by Phillips Co.

The above-mentioned low boiling-point oil may be used alone or any mixture thereof and the total amount formulated is preferably 1 to 50-fold by weight relative to the high molecular weight silicone, preferably 10% to 80% by weight, in the total weight of the hair cosmetic composition.

Any desired agent form may be used in the present invention, and any of the solubilized system, the emulsified system, the powder dispersion system, the two layer oil-water system, and the three layer oil-water-powder system may be used.

In the emulsified system, generally the oil phase containing the high molecular weight silicone is emulsified with a nonionic surfactant, a cationic surfactant, an anionic surfactant or a mixture thereof. In this case, it is preferable to use the method in which a mixture of surfactants with a water-soluble polyhydric alcohol is previously prepared and then mixed with the oil phase, to obtain an emulsifier composition.

The water-soluble polyhydric alcohols usable in the present invention are polyhydric alcohols having two or more hydroxyl groups in the molecule. Typical examples of such polyhydric alcohols are dihydric alcohols such as ethylene glycol, propylene glycol, trimethylene glycol, 1,2-butylene glycol, 1,3-butylene glycol, 1,4-butylen glycol, tetramethylene glycol, 2,3-butylene glycol, pentamethylene glycol, 2-butene-1,4-diol, hexylene glycol, octylene glycol; trihydric alcohols such as glycerine, trimethylol propane, 1,2,6-hexanetriol and the like; tetrahydric alcohols such as pentaerythritol; pentahydric alcohols such as xylitol, etc.; hexahydric alcohols such as sorbitol, mannitol; polyhydric alcohol polymers such as diethylene glycol, dipropylene glycol, polyethylene glycol, polypropylene glycol, tetraethylene glycol, diglycerine, polyethylene glycol, triglyceride, tetraglycerine, polyglycerine; dihydric alcohol alkyl ethers such as ethylene glycol monomethyl ether, ethylene glycol monobutyl ether, ethylene glycol monobutyl ether, ethylene glycol monophenol ether, ethylene glycol monoethyl ether, ethylene glycol mono-2-methylethyl ether, ethylene glycol isomethyl ether, ethylene glycol benzyl ether, ethylene glycol isopropyl ether, ethylene glycol dimethyl ether, ethylene glycol diethyl ether, ethylene glycol dibutyl ether; dihydric alcohol alkyl ethers such as diethylene glycol monomethyl ether, diethylene glycol monobutyl ether, diethylene glycol monobutyl ether, diethylene glycol diethyl ether, diethylene glycol dibutyl ether, diethylene glycol monophenyl ether, ethylene glycol mono-2-methylethyl ether, ethylene glycol isopropyl ether, ethylene glycol dimethyl ether, ethylene glycol diethyl ether, ethylene glycol dibutyl ether; dihydric alcohol esters such as ethylene glycol monoacetate, ethylene glycol monooctyl ether, ethylene glycol monobutyl ether, ethylene glycol monomethyl ether, ethylene glycol isobutyrate, ethylene glycol monobutyl ether, ethylene glycol monophenyl ether, ethylene glycol diacetate, ethylene glycol diisobutyrate, ethylene glycol disuccinate, diethylene glycol monomethyl ether, diethylene glycol monobutyl ether, propylene glycol monomethyl ether, ethylene glycol monobutyl ether, propylene glycol monophenyl ether, propylene glycol monobutyl ether, propylene glycol monophenyl ether, diethylene glycol monobutyl ether, diethylene glycol monophenyl ether, propylene glycol monomethyl ether, ethylene glycol diacetate, ethylene glycol monobutyl ether, ethylene glycol monophenyl ether, ethylene glycol monomethyl ether, ethylene glycol monophenyl ether, ethylene glycol monobutyl ether, ethylene glycol monophenyl ether, ethylene glycol diacetate, ethylene glycol diisobutyrate, ethylene glycol disuccinate.

As the oil constituting the oil phase of the emulsified cosmetic, other than the high molecular weight silicone the following oils may be used,
namely, oil components generally employed in cosmetics compositions including liquid oils and fats such as avocado oil, tsubaki oil, turtle oil, Macadamia nuts oil, corn oil, mink oil, olive oil, rape seed oil, yolk oil, sesame oil, parsley oil, wheat germ oil, sasquash oil, castor oil, linseed oil, safflower oil, cotton seed oil, perilla oil, soybean oil, peanut oil, tea seed oil, kaya oil, rice bran oil, Chinese tung oil, Japanese tung oil, hohoba oil, germ oil, triglyceride, triocanonic acid glycerine, triisopalmitic acid glycerine; solid fats such as cacao fat, coconut oil, horse fat, hardened coconut fat, palm oil, tallow, sheep fat, hardened tallow, palm kernel oil, lard, ox bone fat, wood wax kernel oil, hardened castor oil; waxes such as beeswax, candelilla wax, cotton wax, caruna wax, bayberry wax, insect wax, whale wax, montan wax, rice bran wax, lanolin, kapok wax, lanolin acetate, liquid lanolin, cane wax, isopropyl lanolin fatty acid, hexylaurate, reduced lanolin, jojoba wax, hard lanolin, shellac wax, POE lanolin alcohol ether, POE lanolin alcohol acetate, POE cholesterol ether, lanolin fatty acid polyethylene glycol, POE hydrogenated lanolin alcohol ether; hydrocarbons such as fluid paraffin, ozocerite, squalene, prsten, paraffin, ceresin, squalene, petrolatum, microcrystalline wax; fatty acid oils, alcohols, ester oils such as cetyl octanoate, isopropyl myristate; silicone oils such as dimethylpolysiloxane, methylphenylpolysiloxane; silicone resins and the like.

The preferable formulated amounts of the above components may be 0.5% to 10% by weight in the total amount of the hair cosmetic for the surfactant, and 10% to 80% by weight for the oil phase containing
the high molecular weight silicone, and in the method of preparing previously a mixture of the surfactant and water-soluble polyhydric alcohol and mixing the mixture with the oil phase to give an emulsified composition, the surfactant may be 1% to 20% by weight, the oil phase containing the high molecular weight silicone is 10% to 70% by weight, and the water-soluble polyhydric alcohol is preferably 5% to 30% by weight in the total amount of the hair cosmetic, and about 50% to 99% by weight based on the surfactant.

The emulsification form of the emulsified cosmetic can be the water-in-oil form or oil-in-water form, but is desirable so prepared that the water repellency effect is not lost.

According to the second embodiment a hair cosmetic composition for use in the present invention contains (A) 0.1% to 25% by weight, preferably 0.5% to 15% by weight, in view of the viscosity of the composition, of the above-mentioned high molecular weight silicone (I); (B) 1% to 98.9% by weight of the above-mentioned cyclic silicone; and (C) 1% to 98.9% by weight, preferably 1% to 50% by weight, of trichlorotrifluoroethane and/or tetrachlorodifluoroethane in the total composition, and, optionally, lower alcohols such as ethanol, isopropyl alcohol are provided.

From the viewpoint of application of the hair cosmetic compositions to the hair, the viscosity thereof is generally less than 30000 cps, preferably 20 to 5000 cps.

According to the third embodiment a hair cosmetic composition for use in the present invention contains (A) 0.1% to 25% by weight, preferably 0.5 to 15% by weight, in view of the viscosity of the composition, of the above-mentioned high molecular weight silicone (I); (B) 45% to 98.9% by weight of the above-mentioned cyclic silicone; and (C) 1% to 30% by weight, preferably 5% to 15% by weight, of the lower alcohol such as ethanol, isopropyl alcohol.

From the viewpoint of application of the hair cosmetic compositions to the hair, the viscosity thereof is generally less than 30000, preferably 20 to 5000 cps. The use of too large an amount of the lower alcohol will not allow the dissolution of the high molecular weight silicone.

According to the fourth embodiment as the aerosol type hair cosmetic composition for use in the invention contains (A) 0.01% to 25% by weight, preferably 0.5% to 5% by weight, in view of the applicability of the composition to the hair, of the high molecular weight silicone (I); (B) 1% to 98.9% by weight, preferably 1% to 50% by weight of trichlorotrifluoroethane and/or tetrachlorodifluoroethane; and (C) 5% to 95% by weight, preferably 10% to 80% by weight of an aerosol propellant such as trichlorofluoromethane, dichlorodifluoromethane, dichlorotetrafluoroethane, monochlorn trifluoromethane, dimethylether, propane, isobutane and/or n-butane; and, optionally, (D) a lower alcohol such as ethanol or isopropyl alcohol.

In the hair cosmetic composition for use in the present invention, in addition to the above-mentioned essential constituents, further ingredients such as UV-ray absorbers, anti-oxidants, preservatives, pharmaceutically active substances such as vitamins, hormones, etc., and flavors may be also formulated, depending on the purpose, within quantitative and qualitative ranges that will not impair the present invention.

Examples

Hair cosmetic compositions for use in the present invention will now be further illustrated by, but are by no means limited to, the following Examples and Comparative Examples, wherein all percentages are expressed on a weight basis unless otherwise noted.

Example 1: Hair Oil

| (1) Decamethylcyclopentasiloxane | 70.0% |
| (2) Dimethylpolyisiloxane 5 cps | 20.0 |
| (3) Dimethylpolyisiloxane (R<sub>1</sub> and R<sub>2</sub> in the formula (I) are methyl group, n = 7000) | 10.0 |
| (4) Flavor | q.s. |

(1) - (4) were dissolved and mixed while stirring at 70 - 80 °C, and a viscous liquid hair oil with a viscosity of 500 cps and a good transparency was obtained.
Example 2: Hair Blow

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decamethylcyclopentasiloxane</td>
<td>10.0%</td>
</tr>
<tr>
<td>Methylphenylpolysiloxane (10% of R₁ in the formula (I) is phenyl group with remainder being methyl group, R₂ is methyl group, n = 15000)</td>
<td>1.0</td>
</tr>
<tr>
<td>1,3-Butylene glycol</td>
<td>2.0</td>
</tr>
<tr>
<td>Polyethylene (60) hardened castor oil ester</td>
<td>2.0</td>
</tr>
<tr>
<td>Ethyl alcohol 95%</td>
<td>15.0</td>
</tr>
<tr>
<td>Purified water</td>
<td>70.0</td>
</tr>
<tr>
<td>Flavor</td>
<td>q.s.</td>
</tr>
</tbody>
</table>

(4) was dissolved in (3), and emulsified by an addition of (1), (2) and mixed with (5), (6), (7). The composition was filled in a dispenser vessel, and sprayed in the atomized state onto the hair.

Example 3: Foamy Hair Setting Agent

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimethylpolysiloxane 1.5 cps</td>
<td>3.0%</td>
</tr>
<tr>
<td>Dimethylpolysiloxane 20.0cps</td>
<td>2.0</td>
</tr>
<tr>
<td>Dimethylpolysiloxane (R₁ in the formula (I) is methyl group, R₂ is hydroxy group, n = 5000)</td>
<td>0.7</td>
</tr>
<tr>
<td>Glycerine</td>
<td>3.0</td>
</tr>
<tr>
<td>Polyethylene glycol (120) hardened castor oil ester</td>
<td>3.0</td>
</tr>
<tr>
<td>Behenyltrimethylammonium chloride</td>
<td>0.7</td>
</tr>
<tr>
<td>Flavor</td>
<td>q.s.</td>
</tr>
<tr>
<td>Purified water</td>
<td>83.3</td>
</tr>
</tbody>
</table>

(4) and (5) were dissolved, and emulsified with the addition of a mixture of (1), (2), (3), and then the emulsified product thus obtained was added and mixed into a mixture of (6), (7), (8).

Example 4: Hair Oil

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decamethylcyclopentasiloxane</td>
<td>80.0%</td>
</tr>
<tr>
<td>Dimethylpolysiloxane (R₁ and R₂ in the formula (I) are methyl groups, n = 4000)</td>
<td>8.0</td>
</tr>
<tr>
<td>Organic silicone resin comprising (CH₃)₂SiO₁₂SiO₂/(CH₃)₂SiO = 2.4/1.6 = 1.0 (molar ratio)</td>
<td>2.0</td>
</tr>
<tr>
<td>Ethanol</td>
<td>10.0</td>
</tr>
<tr>
<td>Flavor</td>
<td>q.s.</td>
</tr>
</tbody>
</table>

(1) - (5) were dissolved while stirring at 70 - 80 °C to obtain a liquid hair oil with a viscosity of 700 cps.

Example 5: Hair Oil

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decamethylcyclopentasiloxane</td>
<td>40.0%</td>
</tr>
<tr>
<td>Dimethylpolysiloxane (R₁ and R₂ in the formula (I) are methyl group, n = 3000)</td>
<td>10.0</td>
</tr>
<tr>
<td>Trichlorotrifluoroethane</td>
<td>50.0</td>
</tr>
</tbody>
</table>

(1) - (3) were dissolved and mixed while stirring, and a viscous liquid hair oil with a viscosity of 200 cps and a good transparency was obtained.
Example 6: Hair Oil

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Octamethylcyclotetrasiloxane</td>
<td>20.0%</td>
</tr>
<tr>
<td>(2) Dimethylpolysiloxane (R₁ in the formula (I) is methyl group, R₂ hydroxyl group, n = 10000)</td>
<td>0.5</td>
</tr>
<tr>
<td>(3) Trichlorotrifluoroethane</td>
<td>79.5</td>
</tr>
</tbody>
</table>

A liquid hair oil with a viscosity of 8 cps was obtained in the same manner as in Example 6.

Example 7: Hair Oil

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Dodecamethylcyclohexanesiloxane</td>
<td>30.0%</td>
</tr>
<tr>
<td>(2) Dimethylpolysiloxane (Methyl: Phenyl in R₁ in the formula (I) = 1:1, R₂ methyl, n = 20000)</td>
<td>25.0</td>
</tr>
<tr>
<td>(3) Isopropyl alcohol</td>
<td>5.0</td>
</tr>
<tr>
<td>(4) Trichlorotrifluoroethane</td>
<td>20.0</td>
</tr>
<tr>
<td>(5) Tetrachlorodifluoroethane</td>
<td>20.0</td>
</tr>
</tbody>
</table>

A transparent liquid hair oil with a viscosity of 2000 cps was obtained in the same manner as in Example 6.

Example 8: Hair Oil

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Decamethylcyclopentanesiloxane</td>
<td>20.0%</td>
</tr>
<tr>
<td>(2) Octamethylcyclotetrasiloxane</td>
<td>20.0</td>
</tr>
<tr>
<td>(3) Ethanol (95%)</td>
<td>25.0</td>
</tr>
<tr>
<td>(4) Tetrachlorodifluoroethane</td>
<td>20.0</td>
</tr>
<tr>
<td>(5) Dimethylpolysiloxane (R₁ and R₂ in the formula (I) are methyl group, n = 15,000)</td>
<td>15.0</td>
</tr>
</tbody>
</table>

A transparent liquid hair oil with a viscosity of 1500 cps was obtained in the same manner as in Example 6.

Example 9: Hair Oil

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Decamethylcyclopentasiloxane</td>
<td>70.0%</td>
</tr>
<tr>
<td>(2) Ethanol</td>
<td>20.0</td>
</tr>
<tr>
<td>(3) Dimethylpolysiloxane (R₁ and R₂ in the formula (I) are methyl group, n = 3000)</td>
<td>10.0</td>
</tr>
<tr>
<td>(4) Flavor</td>
<td>q.s.</td>
</tr>
</tbody>
</table>

(1) - (4) were dissolved and mixed while stirring, and a viscous liquid hair oil with a viscosity of 500 cps and a good transparency was obtained.

Example 10: Hair Oil

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Octamethylcyclotetrasiloxane</td>
<td>69.9%</td>
</tr>
<tr>
<td>(2) Dimethylpolysiloxane (R₁ in the formula (I) is methyl group, R₂ hydroxyl group, n = 10000)</td>
<td>0.1</td>
</tr>
<tr>
<td>(3) Ethanol (99%)</td>
<td>30.0</td>
</tr>
</tbody>
</table>

A liquid hair oil with a viscosity of 20 cps was obtained in the same manner as in Example 9.
Example 11: Hair Oil

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Dodecamethylcyclohexasiloxane</td>
<td>45.0%</td>
</tr>
<tr>
<td>(2) Dimethylpolycyclohexane (Methyl: Phenyl in R₁ in the formula (l) = 1:1, R₂ methyl group, n = 20000)</td>
<td>25.0</td>
</tr>
<tr>
<td>(3) Isopropylalcohol</td>
<td>30.0</td>
</tr>
<tr>
<td>(4) Flavor</td>
<td>q.s.</td>
</tr>
</tbody>
</table>

A liquid hair oil with a viscosity of 5000 cps was obtained in the same manner as in Example 9.

Example 12: Hair Oil

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Decamethylcyclopentasiloxane</td>
<td>40.0%</td>
</tr>
<tr>
<td>(2) Octamethylcycloketasiloxane</td>
<td>40.0</td>
</tr>
<tr>
<td>(3) Dimethylpolysiloxane (R₁ and R₂ are methyl group, n = 5000)</td>
<td>5.0</td>
</tr>
<tr>
<td>(4) Dimethylpolysiloxane (Methyl: phenyl in R₁ of the formula (l) = 1:1, R₂ hydroxyl, n = 15000)</td>
<td>10.0</td>
</tr>
<tr>
<td>(5) Ethanol (95%)</td>
<td>2.0</td>
</tr>
<tr>
<td>(6) Isopropylalcohol</td>
<td>3.0</td>
</tr>
</tbody>
</table>

A transparent liquid hair oil with a viscosity of 2500 cps was obtained in the same manner as in Example 9.

Example 13: Hair Spray

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Dimethylpolysiloxane (Methyl: phenyl in the formula (l) = 1:1, R₂ methyl, n = 10000)</td>
<td>0.5%</td>
</tr>
<tr>
<td>(2) Trichlorotrifluoroethane</td>
<td>50.0</td>
</tr>
<tr>
<td>(3) Trichlorofluoromethane</td>
<td>20.0</td>
</tr>
<tr>
<td>(4) Dichlorodifluoromethane</td>
<td>30.0</td>
</tr>
</tbody>
</table>

(1) and (2) were dissolved mixed while stirring and the resultant mixture was charged into an aerosol container. After attaching a valve, (3) and (4) were added therein.

Example 14: Hair Spray

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Dimethylpolysiloxane (R₁ and R₂ in the formula (l) are methyl group, n = 3000)</td>
<td>2.5%</td>
</tr>
<tr>
<td>(2) Dimethylpolysiloxane (R₁ is methyl, R₂ hydroxyl, n = 20,000)</td>
<td>2.5</td>
</tr>
<tr>
<td>(3) Tetrachlorodifluorocyclohexane</td>
<td>10.0</td>
</tr>
<tr>
<td>(4) Trichlorotrifluoroethane</td>
<td>5.0</td>
</tr>
<tr>
<td>(5) Dodecamethylcyclohex siloxane</td>
<td>5.0</td>
</tr>
<tr>
<td>(6) Isoper</td>
<td>10.0</td>
</tr>
<tr>
<td>(7) Ethanol</td>
<td>5.0</td>
</tr>
<tr>
<td>(8) Flavor</td>
<td>q.s.</td>
</tr>
<tr>
<td>(9) Diethyl ether</td>
<td>30</td>
</tr>
<tr>
<td>(10) n-Butane</td>
<td>30</td>
</tr>
</tbody>
</table>

(1) - (8) were dissolved and mixed while stirring and the resultant mixture was charged into an aerosol container. After attaching a valve, (9) and (10) were added therein.
Example 15: Hair Spray

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimethyldipropylsiloxane (R₁ and R₂ in the formula (I) are methyl, n = 10,000)</td>
<td>0.5%</td>
</tr>
<tr>
<td>Tetrachlorodifluoroethane</td>
<td>2.0</td>
</tr>
<tr>
<td>Decamethyldicyclopentasiloxane</td>
<td>75.5</td>
</tr>
<tr>
<td>Ethanol</td>
<td>2.0</td>
</tr>
<tr>
<td>Isopropylalcohol</td>
<td>10.0</td>
</tr>
<tr>
<td>Flavor</td>
<td>q.s.</td>
</tr>
<tr>
<td>Propane</td>
<td>7.0</td>
</tr>
<tr>
<td>Dimethyl ether</td>
<td>3.0</td>
</tr>
</tbody>
</table>

(1) - (8) were dissolved and mixed while stirring and the resultant mixture was charged into an aerosol container. After attaching a valve, (1) and (8) were added therein.

The hair cosmetic compositions according to Examples 1 to 15 of the present invention gave an excellent luster and smoothness to the hair and hair damage preventing and repairing effects, and had an strong hair setting power.

Example 16: Hair Blow

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decamethyldicyclopentasiloxane</td>
<td>15%</td>
</tr>
<tr>
<td>Dimethyldipropylsiloxane (R₁ and R₂ in the formula (I) are methyl groups, n = 3000)</td>
<td>4</td>
</tr>
<tr>
<td>1,3-butylene glycol</td>
<td>2</td>
</tr>
<tr>
<td>Polyethylene (60) hardened castor</td>
<td></td>
</tr>
<tr>
<td>oil ester</td>
<td>2</td>
</tr>
<tr>
<td>Ethanol</td>
<td>15</td>
</tr>
<tr>
<td>Deionized water</td>
<td>62</td>
</tr>
<tr>
<td>Flavor</td>
<td>q.s.</td>
</tr>
</tbody>
</table>

(2) was dissolved in (1), the resultant solution was added to the mixture (3), (4) to be emulsified, and the emulsion then mixed with (5), (6), (7).

Example 17: Hair Mousse (Trademark)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Octamethyldicyclopentasiloxane</td>
<td>13%</td>
</tr>
<tr>
<td>Dimethyldipropylsiloxane (R₁ and R₂ are methyl groups, n = 10000)</td>
<td>2</td>
</tr>
<tr>
<td>Glycerol</td>
<td>1</td>
</tr>
<tr>
<td>Polyethylene (120) hardened castor oil ester</td>
<td>2</td>
</tr>
<tr>
<td>Ethanol</td>
<td>10</td>
</tr>
<tr>
<td>Deionized water</td>
<td>62</td>
</tr>
<tr>
<td>N-butane</td>
<td>7</td>
</tr>
<tr>
<td>Flavor</td>
<td>q.s.</td>
</tr>
</tbody>
</table>

(2) was dissolved in (1), the resultant solution was added to a mixture of (3) and (4) to be emulsified, and the emulsion then mixed with (5), (6), and (7). This mixture was charged into an aerosol container, and after attaching a valve, (8) was filled therein.
Example 18: Hair Cream

(1) Decamethylcyclohexasiloxane  28%
(2) Dimethylpolysiloxane (R₁ and R₂ in the formula (I) are methyl groups, n = 10000)  6
(3) Glycerol  3
(4) Polyethylene (120) hardened castor oil ester  3
(5) Ethanol  10
(6) Deionized water  57
(7) Polyvinyl alcohol  1
(8) Flavor  q.s.

(2) was dissolved in (1), the resultant solution was added to a mixture of (3) and (4) to be emulsified, and the emulsion was mixed with (5), (6), (7), and (8).

Example 19: Hair Oil

(1) Decamethylcyclopentasiloxane  60.0%
(2) Dimethylpolysiloxane (5 cps)  20.0
(3) Dimethylpolysiloxane (R₁ and R₂ in the formula (I) are methyl groups, n = 7000)  10.0
(4) Ethanol  10
(5) Flavor  q.s.

(1) - (5) were dissolved and mixed while stirring at 70 to 80 °C. A viscous liquid hair oil with a viscosity of 500 cps and a good transparency was obtained.

Comparative Example 1: Hair Oil

(1) Decamethylcyclopentasiloxane  60.0%
(2) Dimethylpolysiloxane (5 cps)  30.0
(3) Ethanol  10
(4) Flavor  q.s.

(1) - (4) were dissolved and mixed while stirring at 70 to 80 °C. A viscous liquid hair oil with a viscosity of 500 cps and a good transparency was obtained.

Comparative Example 2: Liquid Hair Conditioner

(1) Vinylpyrrolidone/vinyl acetate copolymer  2.0%
(2) Propylene glycol  2.0
(3) Ethanol  40.0
(4) Deionized water  56.0

After (1) was dissolved in (3), the thus-obtained solution was added thereto, together with (2) to (4), to obtain a transparent liquid hair conditioner.

Evaluation Test

The properties and effects of the hair cosmetic compositions to be used in accordance with the present invention and obtained in Examples 16 - 19 and the conventional products obtained in Comparative
Examples 1 - 2 as described above are shown below.

1. The split hair generation preventive effect was evaluated. Bundles of hair collected from the same person were prepared, the samples were respectively applied to each bundle, and the number of split hairs generated by a mechanical brushing of 10000 strokes was counted.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Number of split hairs generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 17</td>
<td>100/1300</td>
</tr>
<tr>
<td>Example 19</td>
<td>30/1300</td>
</tr>
<tr>
<td>Comparative</td>
<td>200/1300</td>
</tr>
<tr>
<td>Example 1</td>
<td></td>
</tr>
<tr>
<td>Uncoated</td>
<td>300/1300</td>
</tr>
</tbody>
</table>

The products to be used in accordance with the present invention exhibited a remarkable split hair generation prevention effect.

2. The effect of split hair generation prevention in actual use was evaluated. A panel consisting of six members was requested to use the hair oil of Example 19 on one half of the hair on the head and a sample of Comparative Example 1 on the other half, every day, and the amounts of split hairs generated on the corresponding sides after two months were compared.

<table>
<thead>
<tr>
<th>Panel No.</th>
<th>Example 19</th>
<th>Comparative Example 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>D</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>E</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>F</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

++ ... Very few
+ ... Few
± ... Some
- ... Many

It was found that the generation of split hair was reduced in the hair on which the compositions to be used in accordance with the present invention had been applied.
3. The split hair repairing effect was determined. The composition of Example 16 was used on the hair of panel members having many split hairs, and the effect of preventing splitting of the hairs was observed.

<table>
<thead>
<tr>
<th>Panel No.</th>
<th>Conspicuous hair splitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>+</td>
</tr>
<tr>
<td>H</td>
<td>+</td>
</tr>
<tr>
<td>I</td>
<td>++</td>
</tr>
<tr>
<td>J</td>
<td>++</td>
</tr>
</tbody>
</table>

++ Not conspicuous

It was found that the use of the compositions to be used in accordance with the present invention substantially prevented hair splitting.

4. The smoothness was evaluated by a friction measuring machine, and the reduction of the frictional coefficient of the hair was determined.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Frictional coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 17</td>
<td>0.25</td>
</tr>
<tr>
<td>Example 19</td>
<td>0.2</td>
</tr>
<tr>
<td>Comparative Example 1</td>
<td>0.35</td>
</tr>
<tr>
<td>Comparative Example 2</td>
<td>0.6</td>
</tr>
<tr>
<td>Uncoated</td>
<td>0.5</td>
</tr>
</tbody>
</table>

The smaller frictional coefficient represented a greater smoothness, and as can be seen, hair became smoother when the compositions to be used in accordance with the present invention had been used.

Claims

1. The use for preventing the generation of split hair or torn hair and for repairing damaged hair of a hair cosmetic composition comprising at least one high molecular weight silicone having the formula (I):
where each \( R_1 \) represents methyl or one or more of the \( R_1 \)’s represents phenyl and the remainder represent methyl, each \( R_2 \) represents methyl or hydroxy, and \( n \) represents an integer of 3000 to 20000, said composition being free of any dimethicone copolyol.

2. The use as claimed in claim 1, wherein the hair cosmetic composition contains a low boiling-point oil in an amount necessary for dissolving the high molecular weight silicone, said low boiling-point oil comprising a low boiling-point cyclic silicone having the formula:

where \( M^1 \) is an integer of 3 to 7.

3. The use as claimed in claim 2, wherein the cyclic silicone is octamethylcyclotetrasiloxane, decamethyl-cyclopentasiloxane or dodecamethylcyclohexasiloxane.

4. The use as claimed in claim 1, wherein the hair cosmetic composition contains a low boiling-point oil in an amount necessary for dissolving the high molecular weight silicone, said low boiling-point oil comprising a low boiling-point linear silicone having the formula:

where \( m \) is zero or an integer of 1 to 5.

5. The use as claimed in claim 1, wherein the hair cosmetic composition contains a low boiling-point oil in an amount necessary for dissolving the high molecular weight silicone, said low boiling-point oil comprising an isoparaffinic hydrocarbon having a boiling-point at standard pressure of 60 to 260 °C.

6. The use as claimed in any of claims 1 to 5, wherein the hair cosmetic composition is an emulsified cosmetic composition.

7. The use as claimed in any of claims 1 to 6, wherein the emulsified cosmetic composition contains a nonionic surfactant.

8. The use as claimed in claim 6, wherein the emulsified cosmetic composition contains a cationic surfactant.
9. The use as claimed in claim 6, wherein the emulsified cosmetic composition contains an anionic surfactant.

10. The use as claimed in any of claims 6 to 9, wherein the emulsified cosmetic composition in an emulsified cosmetic composition which is emulsified by mixing a mixture of a water-soluble polyhydric alcohol and a surfactant with an oil phase.

11. The use of a non-emulsified or non-aqueous hair cosmetic composition for preventing generation of split hair or torn hair and for repairing damaged hair, said composition comprising at least one high molecular weight silicone having the formula (I):

\[
\begin{align*}
\text{R}_1 & \quad \text{(I)} \\
\text{R}_2 & \quad \text{SiO} \quad \text{SiO} \\
& \quad \text{Si} \quad \text{R}_2 \\
\text{R}_1 & \quad \text{R}_1 \\
\end{align*}
\]

wherein each \( \text{R}_1 \) represents methyl or one or more of the \( \text{R}_1 \)s represents phenyl and the remainder represent methyl, each \( \text{R}_2 \) represents methyl or hydroxy, and \( n \) represents an integer of 3000 to 20000, said composition being free from any dimethicone copolyol.

12. The use as claimed in any of claims 1 to 11, wherein the hair cosmetic composition comprises:

- (A) 0.1% to 25% by weight of at least one high molecular weight silicone having the formula (I) defined in claim 1;
- (B) 1% to 98.9% by weight of at least one cyclic silicone; and
- (C) 1% to 98.9% by weight of trichlorotrifluoroethane and/or tetrachlorodifluoroethane.

13. The use as claimed in any of claims 1 to 11, wherein the hair cosmetic composition comprises:

- (A) 0.1% to 25% by weight of at least one high molecular weight silicone having the formula (I) defined in claim 1;
- (B) 45% to 98.9% by weight of at least one cyclic silicone; and
- (C) 1% of 30% by weight of at least one lower alcohol.

14. The use as claimed in any of claims 1 to 11, wherein the hair cosmetic composition is in the form of an aerosol composition and comprises:

- (A) 0.1% to 25% by weight of at least one high molecular weight silicone having the formula (I) defined in claim 1;
- (B) 1% to 98.9% by weight of trichlorotrifluoroethane and/or tetrachlorodifluoroethane; and
- (C) 5% by weight of an aerosol propellant.

15. The use as claimed in claim 14, wherein the aerosol propellant is at least one compound selected from trichlorofluoromethane, dichlorodifluoromethane, dichlorotetrafluoroethane, monochlorodifluoromethane, dimethylether, propane, isobutane and n-butane.

16. The use of a silicone for the production of a hair cosmetic composition for preventing the generation of split hair or torn hair and for repairing damaged hair, said composition comprising at least one high molecular weight silicone having the formula (I):
17. The use as claimed in claim 16, wherein the hair cosmetic composition is a composition as defined in any of claims 2 to 15.

**Patentansprüche**

1. Verwendung eines haarkosmetischen Mittels zur Vorbeugung der Bildung von gespültem Haar und gebrochenem Haar und zur Behandlung von beschädigtem Haar, enthaltend wenigstens ein Silikon mit hohem Molekulargewicht der Formel (I)

where each \( R_1 \) represents methyl or one or more of the \( R_1 \)s represents phenyl and the remainder represent methyl, each \( R_2 \) represents methyl or hydroxy, and \( n \) represents an integer of 3000 to 20000, said composition being free of any dimethicone copolyol.

2. Verwendung nach Anspruch 1, worin das haarkosmetische Mittel ein niedrigsiedendes Öl in einer Menge enthält, die erforderlich ist, das hochmolekulare Silikon zu lösen, wobei das niedrigsiedende Öl ein cyclisches niedrigsiedendes Silikon der Formel

\[
\begin{array}{c}
\text{CH}_3 \\
\text{SiO} \\
\text{CH}_3
\end{array}
\]

enthält, worin \( M^1 \) eine ganze Zahl von 3 bis 7 ist.

3. Verwendung nach Anspruch 2, worin das cyclische Silikon Octamethylcyclotetrasiloxan, Decamethylcyclodotasisiloxan oder Dodecamethylcyclohexasiloxan ist.

4. Verwendung nach Anspruch 1, worin das haarkosmetische Mittel ein niedrigsiedendes Öl in einer Menge enthält, die erforderlich ist, das hochmolekulare Silikon zu lösen, wobei das niedrigsiedende Öl
ein geradkettiges, niedrigsiedendes Silikon der Formel

\[
\begin{align*}
\text{CH}_3 & \quad \text{SiO} & \quad \text{CH}_3 \\
\text{CH}_3 & \quad \text{SiO} & \quad \text{Si} & \quad \text{CH}_3 \\
\text{CH}_3 & & & & & \text{CH}_3
\end{align*}
\]

enthält, wobei m 0 oder eine ganze Zahl von 1 bis 5 ist.

5. Verwendung nach Anspruch 1, wobei das haarkosmetische Mittel ein niedrigsiedendes Öl in einer Menge enthält, die erforderlich ist, das hochmolekulare Silikon zu lösen, wobei das niedrigsiedende Öl einen Isoparaffinkohlenwasserstoff mit einem Siedepunkt bei Normaldruck von 60 bis 260 °C enthält.

6. Verwendung nach einem der Ansprüche 1 bis 5, wobei das haarkosmetische Mittel ein emulgierendes kosmetisches Mittel ist.

7. Verwendung nach einem der Ansprüche 1 bis 6, wobei das emulgierte kosmetische Mittel ein nichtionisches Tensid enthält.

8. Verwendung nach Anspruch 6, wobei das emulgierte kosmetische Mittel ein kationisches Tensid enthält.

9. Verwendung nach Anspruch 6, wobei das emulgierte kosmetische Mittel ein anionisches Tensid enthält.

10. Verwendung nach einem der Ansprüche 6 bis 9, wobei das emulgierte kosmetische Mittel emulgiert wurde durch Vermischen einer Mischung eines wasserlöslichen Polyhydroxyalkohols und eines Tensids mit einer Ölphase.

11. Verwendung eines nicht emulgierten oder nicht nicht wässrigen haarkosmetischen Mittels zur Vorbeugung der Bildung von gespültem Haar und gebrochenem Haar und zur Behandlung von beschädigtem Haar, wobei diese Zusammensetzung wenigstens ein hochmolekulares Silikon der Formel (I)

\[
\begin{align*}
\text{R}_2 & \quad \text{SiO} & \quad \text{R}_1 \\
\text{R}_1 & & & & & \text{Si} & \quad \text{R}_1 \\
\text{R}_1 & & & & & \text{R}_2 & (I)
\end{align*}
\]

enthält, wobei \( \text{R}_1 \) Methyl bedeutet oder eines oder mehrere von \( \text{R}_1 \) Phenyl und der Rest Methyl bedeutet, jedes \( \text{R}_2 \) Methyl oder Hydroxy und \( n \) eine ganze Zahl von 3000 bis 20000 bedeuten, wobei diese Zusammensetzung frei von einem Dimethiconcopolyol ist.

12. Verwendung nach einem der Ansprüche 1 bis 11, wobei das haarkosmetische Mittel (A) 0,1 bis 25 Gew. % wenigstens eines hochmolekularen Silikons der Formel (I), wie in Anspruch 1 definiert,

(B) 1 bis 98,9 Gew. % wenigstens eines cyclischen Silikons und

(C) 1 bis 98,9 Gew. % Trichlortrifluorethan und/oder Tetrachlordifluorethan enthält.

13. Verwendung nach einem der Ansprüche 1 bis 11, wobei das haar-kosmetische Mittel
(A) 0,1 bis 25 Gew. % wenigstens eines hochmolekularen Silikons der Formel (I), wie in Anspruch 1 definiert,
(B) 45 bis 98,9 Gew. % wenigstens eines cyclischen Silikons und
(C) 1 bis 30 Gew. % wenigstens eines niedereren Alkohols enthält.

14. Verwendung nach einem der Ansprüche 1 bis 11, wozu das haarkosmetische Mittel in Form eines Aerosols vorliegt und
   (A) 0,1 bis 25 Gew. % wenigstens eines hochmolekularen Silikons der Formel (I) wie in Anspruch 1 definiert.
   (B) 1 bis 98,9 Gew. % Trichlortrifluorethan und/oder Tetrachlortrifluorethan und
   (C) 5 bis 95 Gew. % eines Aerosol-Treibgases enthält.

15. Verwendung nach Anspruch 14, wozu das Aerosol-Treibgas wenigstens eine Verbindung, ausgewählt aus Trichlortrifluormethan, Dichlortrifluormethan, Dichlortetrafluorethan, Monochlortrifluormethan, Dimethylether, Propan, Isobutyl n-Butan ist.

16. Verwendung eines Silikons zur Herstellung eines haarkosmetischen Mittels zur Vorbeugung der Bildung von gespültem Haar und gebrochenem Haar und zur Behandlung von beschädigtem Haar, wobei diese Zusammensetzung wenigstens ein hochmolekulares Silikon der Formel (I)

\[
\begin{array}{c}
R_2 \quad SiO \quad \left[ \begin{array}{c}
R_1 \\
\quad SiO \\
\quad R_1 \\
n \\
\quad R_1 \\
\end{array} \right] \quad Si \quad R_2 \quad (I)
\end{array}
\]

enthält, wozu R_1 Methyl bedeutet oder eines oder mehrere von R_1 Phenyl und der Rest Methyl bedeuten, jedes R_2 Methyl oder Hydroxy und n eine ganze Zahl von 3000 bis 20000 bedeuten, wobei die Zusammensetzung frei von einem Dimethiconcopolyol ist.

17. Verwendung nach Anspruch 16, wozu das haarkosmetische Mittel eine Zusammensetzung ist, wie sie in einem der Ansprüche 2 bis 15 bezeichnet ist.

Reviendications

1. L'utilisation pour la prévention de l'apparition de cheveux fourchus ou cheveux abîmés et pour le traitement des cheveux endommagés, d'une composition cosmétique capillaire comprenant au moins un silicone de poids moléculaire élevé représenté par la formule (I)

\[
\begin{array}{c}
R_2 \quad SiO \quad \left[ \begin{array}{c}
R_1 \\
\quad SiO \\
\quad R_1 \\
n \\
\quad R_1 \\
\end{array} \right] \quad Si \quad R_2 \quad (I)
\end{array}
\]

dans laquelle:
   chaque groupe R_1 représente un radical méthyle ou un ou plusieurs groupes R_1 représentant un radical phényle et le reste des groupes R_1 représente un radical méthyle;
   chaque groupe R_2 représente un radical méthyle ou hydroxy, et
   n représente un nombre entier compris entre 3000 et 20 000;
ladite composition étant exempte de tout copolyol de diméthicone.

2. Utilisation selon la revendication 1, caractérisée en ce que la composition cosmétique capillaire contient une huile de faible point d'ébullition en une quantité nécessaire pour dissoudre le silicone de haut poids moléculaire et ladite huile de faible point d'ébullition comprenant un silicone cyclique de faible point d'ébullition de formule:

\[
\begin{array}{c}
\text{CH}_3 \\
\text{Si} \\
\text{CH}_3
\end{array}
\]

\[M^1\]

dans laquelle:

\[M^1\] représente un nombre entier compris entre 3 et 7.

3. Utilisation selon la revendication 2, caractérisée en ce que le silicone cyclique est l'octaméthylcyclotétrasiloxane, le dêcaméthylcyclopentasiloxane ou le dodécaméthylcyclohexasiloxane.

4. Utilisation selon la revendication 1, caractérisée en ce que la composition cosmétique capillaire contient une huile de faible point d'ébullition en une quantité nécessaire pour dissoudre le silicone de haut poids moléculaire, ladite huile de faible point d'ébullition comprenant un silicone linéaire de faible point d'ébullition de formule:

\[
\begin{array}{c}
\text{CH}_3 \\
\text{Si} \\
\text{Si} \\
\text{CH}_3
\end{array}
\]

\[\text{Si} - \text{CH}_3
\]

(I)

dans laquelle:

\[m\] représente 0 ou un nombre entier compris 1 et 5.

5. Utilisation selon la revendication 1, caractérisée en ce que la composition cosmétique capillaire contient une huile de faible point d'ébullition en une quantité nécessaire pour dissoudre le silicone de haut poids moléculaire, ladite huile de faible point d'ébullition comprenant un hydrocarbure isoparaffinique ayant un point d'ébullition à la pression standard compris entre 60 °C et 260 °C.

6. Utilisation selon l'une quelconque des revendications 1 à 5, caractérisée en ce que la composition cosmétique capillaire est une composition cosmétique émulsifiée.

7. Utilisation selon l'une quelconque des revendications 1 à 6, caractérisée en ce que la composition cosmétique émulsifiée contient un tensioactif non-ionique.

8. Utilisation selon la revendication 6, caractérisée en ce que la composition cosmétique émulsifiée contient un tensioactif cationique.

9. Utilisation selon la revendication 6, caractérisée en ce que la composition cosmétique émulsifiée contient un tensioactif anionique.
10. Utilisation selon l’une quelconque des revendications 6 à 9, caractérisée en ce que la composition cosmétique émulsifiée est émulsifiée par mélange d’un mélange d’alcool polyvalent hydrosoluble et d’un tensioactif avec une phase huileuse.

11. Utilisation d’une composition cosmétique capillaire non-aqueuse ou non-émulsifiée pour la prévention de l’apparition de cheveux fourchus ou de cheveux abîmés et pour le traitement des cheveux endommagés, ladite composition comprenant au moins un silicone de haut poids moléculaire représenté par la formule (I):

\[
\begin{align*}
\text{R}_2 - \text{SiO} & \begin{array}{c} \text{R}_1 \\ \vdots \end{array} \begin{array}{c} \text{R}_1 \\ \vdots \end{array} \begin{array}{c} \text{SiO} \\ \vdots \end{array} \begin{array}{c} \text{R}_1 \\ \vdots \end{array} \\
\text{R}_1 & \begin{array}{c} \text{Si} \\ \vdots \end{array} \begin{array}{c} \text{R}_1 \\ \vdots \end{array} \\
\text{R}_2 & \begin{array}{c} \text{Si} \\ \vdots \end{array} \\
\end{align*}
\]

(\text{I})

dans laquelle:
- chaque groupe \( \text{R}_1 \) représente un radical méthyle ou un ou plusieurs groupes \( \text{R}_1 \) représentent un radical phényle et le reste des groupes \( \text{R}_1 \) représente un radical méthyle;
- chaque groupe \( \text{R}_2 \) représente un radical méthyle ou hydroxy, et
- \( n \) représente un nombre entier compris entre 3000 et 20 000;

ladite composition étant exempte de tout copolyol de diméthicone.

12. Utilisation selon l’une quelconque des revendications 1 à 11, caractérisée en ce que la composition cosmétique capillaire comprend:
- (A) de 0,1 à 25% en poids d’au moins un silicone de haut poids moléculaire représenté par la formule (I) définie dans la revendication 1;
- (B) de 1 à 98,9% en poids d’au moins un silicone cyclique; et
- (C) de 1 à 98,9% en poids de trichlorotrifluoroéthane et/ou tétrachlorodifluoroéthane.

13. Utilisation selon l’une quelconque des revendications 1 à 11, caractérisée en ce que la composition cosmétique capillaire comprend:
- (A) de 0,1 à 25% en poids d’au moins un silicone de haut poids moléculaire représenté par la formule (I) définie dans la revendication 1;
- (B) de 45 à 98,9% en poids d’au moins un silicone cyclique; et
- (C) de 1 à 30% en poids d’au moins un alcool inférieur.

14. Utilisation selon l’une quelconque des revendications 1 à 11, caractérisée en ce que la composition cosmétique capillaire est sous la forme d’une composition aérosol qui comprend:
- (A) de 0,1 à 25% en poids d’au moins un silicone de haut poids moléculaire représenté par la formule (I) définie dans la revendication 1;
- (B) de 1 à 98,9% en poids de trichlorotrifluoroéthane et/ou tétrachlorodifluoroéthane; et
- (C) de 5 à 95% en poids d’un gaz propulseur pour aérosol.

15. Utilisation selon la revendication 14, caractérisée en ce que le gaz propulsé par aérosol correspond à au moins l’un des composés sélectionné dans le groupe constitué par: trichlorofluorométhane, dichlorodifluorométhane, dichlorotétrafluoroéthane, monochlorodifluorométhane, diméthyléther, propane, isobutane et n-butane.

16. Utilisation d’un silicone pour la préparation d’une composition cosmétique capillaire permettant la prévention de l’apparition de cheveux fourchus ou cheveux abîmés et le traitement des cheveux endommagés, ladite composition comprenant au moins un silicone de haut poids moléculaire de formule (I):
dans laquelle:

chaque groupe $R_1$ représente un radical méthyle ou un ou plusieurs groupes $R_1$ représentent un radical phényle et le reste des groupes $R_1$ représente un radical méthyle;

chaque $R_2$ représente un radical méthyle ou hydroxy, et

$n$ représente un nombre entier compris entre 3000 et 20 000;

ladite composition étant exempte de tout copolyl de diméthicone.

17. Utilisation selon la revendication 16, caractérisée en ce que la composition cosmétique capillaire correspond à une composition telle que définie dans l'une quelconque des revendications 2 à 15.