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(54) Title: HAIR STYLING COMPOSITION

(57) Abstract: A method of styling hair comprising the step of applying to the hair a composition comprising an emulsion comprising: a) hydrophobically modified particles selected from the group consisting of silica, metal oxide and mixtures thereof; b) amino functionalised silicone; and c) water.



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HAIR STYLING COMPOSITION

The present invention relates to hair styling creams.

- 5 Hair styling compositions should meet a number of functional requirements. These include good holding ability and style retention without giving a harsh, brittle feeling to the hair.

10 Conventional hairspray and mousse formulations are frequently volatile aqueous solvent based and therefore form highly wetting systems for hair. Coalescence of the composition droplets on the hair fibre and subsequent ethanol evaporation to leave solid polymer residue leads to a network of fibre-fibre bonds.

15 There are, however, undesirable consequences in coating hair with polymer, manifesting in perceptions of sensory negatives such as stickiness, the sticky feeling of the hair is exacerbated when the styling product is formulated as a cream. The present invention relates to hair styling creams that mitigate the sticky feeling.

20 **Summary of the Invention**

Accordingly the present invention relates to a method of styling hair comprising the step of applying to the hair a composition comprising an emulsion comprising:

- 25 a) hydrophobically modified particles selected from the group consisting of silica or metal oxide and mixtures thereof;
- b) amino functionalised silicone; and
- c) water.

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Description of the Invention

Compositions of the invention may be water in oil or oil in water based emulsions. Preferably they are oil in water based emulsions.

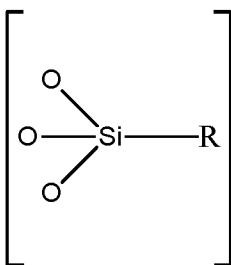
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Unless stated otherwise the viscosity of silicones can be measured by means of a glass capillary viscometer as set out further in Dow Corning Corporate Test Method CTM004, July 20 1970 at a temperature of 25°C.

10 Hydrophobically modified particles

The compositions of the invention comprise hydrophobically modified particles of silica, metal oxide or mixtures thereof. Preferably the hydrophobically modified particles comprise silica or titanium oxide, more preferably hydrophobically
15 modified silica (silicon dioxide) .

It is particularly preferred if the hydrophobically modified silica comprises the hydrophobic group of formula:



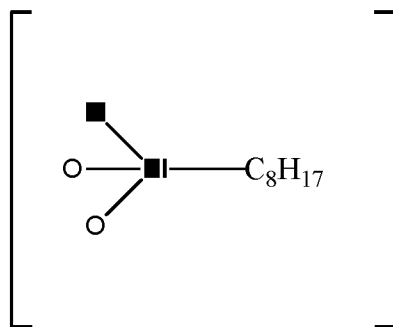
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in which R is a C₄ to C₁₈ alkyl group.

Particularly preferred is the hydrophobically modified silicone dioxide comprising:

25

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Preferred silica particles are described in US 7 282 236 and made commercially available from suppliers like Evonik Degussa GmbH under the names Aerosil
 5 R812, R202, and R805. Silica having a C4 to C15 alkyl group attached to the silane are preferred. Particularly preferred is octylsilane comprising the group represented by formula above (sold under the name Aerosil R805).

The hydrophobically modified silica preferably has a primary particle size (in its
 10 dry state) from 1nm to 100 nm, more preferably from 5 to 70nm.

Primary particles sizes can be derived from Transmission Electron Microscopy according to the method described by S. Gu et al in Journal of Colloid and
 Interface Science 289 (2005) 419-426.

15

Composition of the invention preferably comprise from 0.05 to 15 wt% of the total composition of hydrophobically modified silica, more preferably from 0.1 to 10 wt%, and most preferably from 0.2 to 5 wt%.

20 **Amino Functionalised Silicone**

Compositions according to the invention comprise an amino functional silicone. By "amino functionalised silicone" is meant a silicone containing at least one primary, secondary or tertiary amine group, or a quaternary ammonium group.

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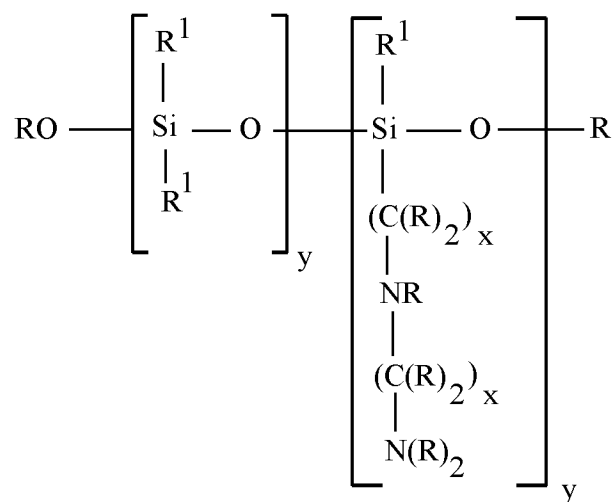
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The primary, secondary, tertiary and/or quaternary amine groups may either form part of the main polymer chain or more preferably be carried by a side or pendant group carried by the polymeric backbone.

- 5 Suitable amino functionalised silicone polymers for use with the invention are described in US 4 185 087.

Amino functionalised silicones suitable for use in the invention will typically have a mole % amine functionality in the range of from about 0.1 to about 8.0 mole %, preferably from about 0.1 to about 5.0 mole %, most preferably from about 0.1 to about 2.0 mole %. In general the amine concentration should not exceed about 8.0 mole % since we have found that too high an amine concentration can be detrimental to total silicone deposition and therefore conditioning performance.

- 15 In a preferred embodiment, the functionalized polymers are of the amodimethicone having the general formula:



- 20 where each R is independently H, or a C₁₋₄ alkyl, preferably H; each R¹ is independently OR or a C₁₋₄ alkyl; and

- 5 -

each x is independently an integer from 1 to 4 and each y is greater than zero and independently an integer to yield a polymer having a molecular weight from 500 to 1 million, and preferably, from 750 to 25,000, and most preferably from 1,000 to 15,000. Particularly preferred are silicones comprising an amino glycol
5 copolymer. Especially preferred is Bis (C13-C15 alkoxy) PG amodimethicone such as DC 8500 by Dow Corning .

It is also within the scope of this invention for the functionalized polymer to comprise trimethylsilylamodimethicone.

10

Preferably the level of amino functionalised silicone polymers make up from 0.05 to 15 wt% of the total composition, preferably from 0.1 to 10%, and most preferably from 0.2 to 5 wt%.

15 Preferably the weight ratio of hydrophobically modified particle to amino functionalised silicone is from 3:1 to 1:50, more preferably from 1:1 to 1:10.

When a high ratio (greater than 1:1) of hydrophobically modified particle to amino silicone is used it is preferred if the a non-amino functional silicone is present,
20 preferably at a weight ratio of greater than 1:1 non-amino functional silicone to amino functional silicone, more preferably at a ratio of greater than 2:1.

Suitable non-amino functional silicones are disclosed below.

25 **Styling Polymers**

Compositions of the invention may comprise styling polymers.

Hair styling polymers are well known articles of commerce and many such
30 polymers are available commercially which contain moieties which render the

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polymers cationic, anionic, amphoteric or nonionic in nature. The polymers may be synthetic or naturally derived.

Styling aids such as vinylic polymer are preferred, in particular block copolymers.

5

The amount of the hair styling polymer may range from 0.1 to 25%, preferably 0.5 to 20 %, more preferably 1.0 to 18% by weight based on total weight of the composition.

10 Examples of anionic hair styling polymers are:

copolymers of vinyl acetate and crotonic acid;

terpolymers of vinyl acetate, crotonic acid and a vinyl ester of an alpha-branched saturated aliphatic monocarboxylic acid such as vinyl neodecanoate;

15

copolymers of methyl vinyl ether and maleic anhydride (molar ratio about 1:1) wherein such copolymers are 50% esterified with a saturated alcohol containing from 1 to 4 carbon atoms such as ethanol or butanol;

20 acrylic copolymers containing acrylic acid or methacrylic acid as the anionic radical-containing moiety with other monomers such as: esters of acrylic or methacrylic acid with one or more saturated alcohols having from 1 to 22 carbon atoms (such as methyl methacrylate, ethyl acrylate, ethyl methacrylate, n-butyl acrylate, t-butyl acrylate, t-butyl methacrylate, n-butyl methacrylate, n-hexyl
25 acrylate, n-octyl acrylate, lauryl methacrylate and behenyl acrylate);

glycols having from 1 to 6 carbon atoms (such as hydroxypropyl methacrylate and hydroxyethyl acrylate);

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styrene; vinyl caprolactam; vinyl acetate; acrylamide; alkyl acrylamides and methacrylamides having 1 to 8 carbon atoms in the alkyl group (such as methacrylamide, t-butyl acrylamide and n-octyl acrylamide); and other compatible unsaturated monomers.

5

The polymer may also contain grafted silicone, such as polydimethylsiloxane.

Specific examples of suitable anionic hair styling polymers are:

10 RESYN® 28-2930 available from National Starch (vinyl acetate/crotonic acid/vinyl neodecanoate copolymer);

ULTRAHOLD® 8 available from BASF (CTFA designation Acrylates/acrylamide copolymer);

15

the GANTREZ®ES series available from ISP corporation (esterified copolymers of methyl vinyl ether and maleic anhydride).

Other suitable anionic hair styling polymers include carboxylated polyurethanes.

20 Carboxylated polyurethane resins are linear, hydroxyl-terminated copolymers having pendant carboxyl groups. They may be ethoxylated and/or propoxylated at least at one terminal end. The carboxyl group can be a carboxylic acid group or an ester group, wherein the alkyl moiety of the ester group contains one to three carbon atoms. The carboxylated polyurethane resin can also be a copolymer of

25 PVP/polycarbamyl polyglycol ester. Suitable carboxylated polyurethane resins are disclosed in EP-A-0619111 and US Patent No. 5,000,955. Other suitable hydrophilic polyurethanes are disclosed in US Patent Nos. 3,822,238; 4,156,066; 4,156,067; 4,255,550; and 4,743,673.

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Amphoteric hair styling polymers which can contain cationic groups derived from monomers such as t-butyl aminoethyl methacrylate as well as carboxyl groups derived from monomers such as acrylic acid or methacrylic acid can also be used in the present invention. One specific example of an amphoteric hair styling
5 polymer is Amphomer® (Octylacrylamide/ acrylates/butylaminoethyl methacrylate copolymer) sold by the National Starch and Chemical Corporation.

Examples of nonionic hair styling polymers are homopolymers of N-vinylpyrrolidone and copolymers of N-vinylpyrrolidone with compatible nonionic
10 monomers such as vinyl acetate. Nonionic polymers containing N-vinylpyrrolidone in various weight average molecular weights are available commercially from ISP Corporation - specific examples of such materials are homopolymers of N-vinylpyrrolidone having an average molecular weight of about 630,000 sold under the name PVP K-90 and are homopolymers of N-
15 vinylpyrrolidone having an average molecular weight of about 1,000,000 sold under the name of PVP K-120.

Other suitable nonionic hair styling polymers are cross-linked silicone resins or gums. Specific examples include rigid silicone polymers such as those described
20 in EP-A-0240350 and cross-linked silicone gums such as those described in WO 96/31188.

Examples of suitable naturally-derived hair styling polymers include shellac, alginates, gelatins, pectins, cellulose derivatives and chitosan or salts and
25 derivatives thereof. Commercially available examples include Kytamer® (ex Amerchol) and Amaze® (ex National Starch).

Also suitable for use as optional components in the compositions of the invention are the ionic copolymers described in WO 93/03703, the polysiloxane-grafted
30 polymers disclosed in WO 93/23446, the silicone-containing polycarboxylic acid

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copolymers described in WO 95/00106 or WO 95/32703, the thermoplastic elastomeric copolymers described in WO 95/01383, WO 95/06078, WO 95/06079 and WO 95/01384, the silicone grafted adhesive polymers disclosed in WO 95/04518 or WO 95/05800, the silicone macro-grafted copolymers taught in
5 WO 96/21417, the silicone macromers of WO 96/32918, the adhesive polymers of WO 98/48770 or WO 98/48771 or WO 98/48772 or WO 98/48776, the graft polymers of WO 98/51261 and the grafted copolymers described in WO 98/51755.

With certain of the above-described polymers it may be necessary to neutralise
10 some acidic groups to promote solubility/dispersibility. Examples of suitable neutralising agents include 2-amino-2-methyl-1,3-propanediol (AMPD); 2-amino-2-ethyl-1,3-propanediol (AEPD); 2-amino-2-methyl-1-propanol (AMP); 2-amino-1-butanol (AB); monoethanolamine (MEA); diethanolamine (DEA); triethanolamine (TEA); monoisopropanolamine (MIPA); diisopropanol-amine (DIPA);
15 triisopropanolamine (TIPA); and dimethyl stearamine (DMS). A long chain amine neutralising agent such as stearamidopropyl dimethylamine or lauramidopropyl dimethylamine may be employed, as is described in US 4,874,604. Also suitable are inorganic neutralisers, examples of which include sodium hydroxide, potassium hydroxide and borax. Mixtures of any of the above neutralising agents
20 may be used. Amounts of the neutralising agents will range from about 0.001 to about 10% by weight of the total composition.

Examples of cationic hair styling polymers are copolymers of amino-functional acrylate monomers such as lower alkyl aminoalkyl acrylate, or methacrylate
25 monomers such as dimethylaminoethyl methacrylate, with compatible monomers such as N-vinylpyrrolidone, vinyl caprolactam, alkyl methacrylates (such as methyl methacrylate and ethyl methacrylate) and alkyl acrylates (such as ethyl acrylate and n-butyl acrylate).

30 Specific examples of suitable cationic hair styling polymers are:

- 10 -

copolymers of N-vinylpyrrolidone and dimethylaminoethyl methacrylate, available from ISP Corporation as Copolymer 845, Copolymer 937 and Copolymer 958;

5 copolymers of N-vinylpyrrolidone and dimethylaminopropylacrylamide or methacrylamide, available from ISP Corporation as Stylezeâ CC10;

copolymers of N-vinylpyrrolidine and dimethylaminoethyl methacrylate;

10 copolymers of vinylcaprolactam, N-vinylpyrrolidone and dimethylaminoethylmethacrylate;

Polyquaternium-4 (a copolymer of diallyldimonium chloride and hydroxyethylcellulose);

15 Polyquaternium-11 (formed by the reaction of diethyl sulphate and a copolymer of vinyl pyrrolidone and dimethyl aminoethylmethacrylate), available from ISP as Gafquatâ 734, 755 and 755N, and from BASF as Luviquat PQ11;

20 Polyquaternium-16 (formed from methylvinylimidazolium chloride and vinylpyrrolidone), available from BASF as Luviquat FC 370, FC 550, FC 905 and HM-552;

25 Polyquaternium-46 (prepared by the reaction of vinylcaprolactam and vinylpyrrolidone with methylvinylimidazolium methosulphate), available from BASF as Luviquat Hold.

Polyquaternium-68 (the polymeric quaternary ammonium salt formed by the polymerization of vinylpyrrolidone, methacrylamide, vinylimidazole and 3-methyl-1-vinylimidazolium methosulphate) available from BASF as Luviquat Supreme.

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The polyquaternium polymers described above are particularly preferred.

The amount of the hair styling polymer may range from 0.1 to 12%, preferably 0.5 to 10 %, more preferably 0.75 to 8% by weight based on total weight of the composition.

5

Further ingredients

The formulation may include conditioning materials such as surfactants, cationic conditioners suitable for hair, non amino functionalised silicones and their emulsions.

10

Preferably the composition does not contain anionic or nonionic surfactants.

Suitable non amino functionalised silicones include polydiorganosiloxanes, in particular polydimethylsiloxanes which have the CTFA designation dimethicone. Also suitable for use compositions of the invention (particularly shampoos and conditioners) are polydimethyl siloxanes having hydroxyl end groups, which have the CTFA designation dimethiconol. Also suitable for use in compositions of the invention are silicone gums having a slight degree of cross-linking, as are described for example in WO 96/31188.

15

20

The viscosity of the emulsified silicone itself (not the emulsion or the final hair conditioning composition) is typically at least 10,000 cst. The viscosity of the silicone itself is preferably at least 60,000 cst, most preferably at least 500,000 cst, ideally at least 1,000,000 cst. Preferably the viscosity does not exceed 10^9 cst for ease of formulation.

25

Emulsified silicones for use the invention will typically have an average silicone particle size in the composition of less than 30, preferably less than 20, more preferably less than 10 microns. Most preferably the average silicone particle size

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of the emulsified silicone in the composition is less than 2 microns, ideally it ranges from 0.01 to 1 micron. Silicone emulsions having an average silicone particle size of ≤ 0.15 microns are generally termed microemulsions.

- 5 Particle size may be measured by means of a laser light scattering technique, using a 2600D Particle Sizer from Malvern Instruments.

Suitable silicone emulsions for use in the invention are also commercially available in a pre-emulsified form.

10

Examples of suitable pre-formed emulsions include DC 1784, DC 1785, DC 2-1865. These are all emulsions/microemulsions of dimethiconol. Cross-linked silicone gums are also available in a pre-emulsified form, which is advantageous for ease of formulation. A preferred example is the material available from Dow

- 15 Corning as DC X2-1787, which is an emulsion of cross-linked dimethiconol gum. A further preferred example is the material available from Dow Corning as DC X2-1391, which is a microemulsion of cross-linked dimethiconol gum.

- 20 The total amount of silicone incorporated into compositions of the invention depends on the level of conditioning desired and the material used. A preferred amount is from 0.01 to about 12% by weight of the total composition.

Other oils can also be included in the composition such as ester emollients, polyhydric alcohol esters, wax esters and sugar ester of fatty acids.

25

If present particularly preferred are natural ester emollients principally based upon mono-, di- and tri- glycerides. Representative glycerides include sunflower seed oil, cottonseed oil, borage oil, borage seed oil, primrose oil, castor and hydrogenated castor oils, rice bran oil, soybean oil, olive oil, safflower oil, shea butter, jojoba oil and combinations thereof. Animal derived emollients are

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represented by lanolin oil and lanolin derivatives. Amounts of the natural esters may optionally range from about 0.1 to about 20% by weight of the end use compositions.

- 5 Creams according to the invention may contain a structurant or thickener, typically in an amount of from 0.01% to 10% by weight.

Examples of suitable structurants or thickeners are polymeric thickeners such as carboxyvinyl polymers. Particularly preferred thickeners are cationic thickening
10 agents, more preferred are acrylamide/methacrylate based copolymers, especially preferred are polymers of dimethylacrylamide and methacrylate in particular dimethylacrylamide/ethyltrimonium chloride methacrylate copolymer such as Tinovis CD ex BASF.

- 15 Other materials that can also be used as structurants or thickeners include those that can impart a gel-like viscosity to the composition, such as water soluble or colloiddally water soluble polymers like cellulose ethers (e.g. methylcellulose, hydroxyethylcellulose, hydroxypropylmethylcellulose and carboxymethylcellulose), guar gum, sodium alginate, gum arabic, xanthan gum, polyvinyl alcohol, polyvinyl
20 pyrrolidone, hydroxypropyl guar gum, starch and starch derivatives, and other thickeners, viscosity modifiers, gelling agents, etc. It is also possible to use inorganic thickeners such as bentonite or laponite clays.

- Such styling products frequently include a carrier and further additional
25 components. The carriers and additional components required to formulate such products vary with product type and can be routinely chosen by one skilled in the art. The following is a description of some of these carriers and additional components.

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The pH of the formulation is preferably from 4.5 to 8 at 25°C. More preferably from 5 to 7.

Hair care compositions of the present invention can comprise a carrier, or a
5 mixture of such carriers, which are suitable for application to the hair. The carriers are present at from about 0.5% to about 99.5%, preferably from about 5.0% to about 99.5%, more preferably from about 10.0% to about 98.0%, of the composition. As used herein, the phrase "suitable for application to hair" means that the carrier does not damage or negatively affect the aesthetics of hair or
10 cause irritation to the underlying skin.

Compositions according to the invention comprise a buffer or pH adjuster. Preferred buffers or pH adjusters include weak acids and bases such
glycine/sodium hydroxide, citric acid, lactic acid, succinic acid, acetic salt and salts
15 thereof. Frequently a mixture of buffering system is used such as sodium citrate and citric acid.

Compositions of the invention comprise water as a solvent. Further solvents may be present. Suitable solvents include the C₁-C₆ alcohols, lower alkyl acetate and
20 mixtures thereof being preferred. The solvents can also contain a wide variety of additional materials such as volatile silicones such as cyclomethicone.

The compositions of the present invention may also contain adjuncts suitable for hair care. Generally such ingredients are included individually at a level of up to 2
25 wt%, preferably up to 1 wt% of the total composition. Suitable hair care adjuncts, include amino acids, antidandruff agents, sugars and ceramides, sun-screening agents, carboxylic acid polymer thickeners.

Compositions of the present invention are formulated into hair care compositions
30 with hair styling claims. The compositions are preferably used to non-permanently

- 15 -

style human hair and, more preferably, they are packaged and labeled as such. The term non-permanently mean that during the styling process the inter cystine-disulphide bonds are not broken. This means that there are preferably no reductive agents in the hair care composition.

5

It is preferred if the products are left on hair after application and not immediately washed off (within 10 minutes of application). Such products are known as leave in compositions. Leave in styling compositions are particularly preferred.

10 **Process**

A preferred process comprises forming a pre-emulsion comprising hydrophobic particles (preferably silica) dispersed in the silicone oils (aminosilicone). Preferably this phase is free of nonionic and anionic surfactants.

15

Especially preferred is a process for producing the composition comprising the following steps:

- 20 i) forming a first phase by dispersing hydrophobic particles (preferably silica) in silicone oils (aminosilicone); followed by addition to water to form an emulsion.
- ii) forming a second aqueous phase.
- iii) combined the two phases to form a uniform structure.

25 The following non-limiting Examples further illustrate the preferred embodiments of the invention. Examples of the invention are illustrated by a number, comparative examples are illustrated by a letter. All percentages referred to in the examples and throughout this specification are by weight based on total weight unless otherwise indicated.

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Examples**Table 1 -Comparative Examples**

5

Ingredient	Example A Wt%	Example B Wt%
Water and minors	To 100	to 100
Purac S88 (Lactic Acid)	0.44	0.44
Lexamine S-13 (Stearamidopropyl Dimethylamine)	1.600	1.600
Lanette S3 (cetyl/stearyl alcohol)	6.000	6.000
Petrolatum	0.200	0.200
Mineral Oil	0.300	0.300
DC 1785 Silicone Emulsion	1.300	1.300
Luviquat Hold (20%)	0	15

Examples A and B are conventional creams made in a conventional manner.

10

Table 2 - Examples 1 and 2 (oil in water emulsion)

	Ingredient	Example 1 Wt%	Example 2 Wt%
Phase I	Water and preservative	70.87	59.94
	Tinovis CD (50%) ¹	2.00	3.00
Phase II	Aerosil R805 ³	0.50	0.50
	DC 8500 ⁵	0.45	0.45
	DC 200 fluid 5 cst ⁶	1.55	1.55
	DC 200 fluid 50 cst ⁶	2.50	2.50
	Luviquat Hold (20%) ⁴		15.00
	Glycerin	2.00	2.00
	Mineral Oil 70 SUS	1.00	1.00
	Water	2.00	2.00
Phase III	Water	To 100	To 100
	NaOH(10%)	To PH 5 -6	To PH 5-6
	Perfume	0.50	0.50

- 5 1 - Dimethylacrylamide/Ethyltrimonium Chloride Methacrylate Copolymer, C10-11 IsoparaffinPropylene Glycol Dicaprylate/Dicaprate, PPG-1 Trideceth-6 ex BASF;
- 2 - methylchloroisothiazolinone, methylisothiazolinone ex The Dow chemical Company
- 3 – fumed silica surface treated with octylsilane ex Evonik Degussa GmbH
- 10 4 - Polyquaternium-46
- 5 - Bis (C13-C15 alkoxy) PG amodimethicone ex Dow Corning
- 6 – DC 200 fluid 5 cst and 50 cst ex Dow Corning

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Formulation process:

To form phase 2 the silica particles are dispersed in the silicone oils (aminosilicone oil DC8500/ DC 200 fluid 50 cst and 5 cst). Styling polymer, glycerine, mineral oil, water are respectively added into the oil phase by stirring.

- 5 In phase 1, the thickening polymer Tinovis CD is added into the water phase by stirring slowly followed by the remaining ingredient. Phase I and phase II are combined by light homogenization to form a uniform structure. The NaOH aqueous solution is added to adjust the pH to 5-6 and the fragrance is added in final step. The process takes place under ambient temperature.

10

The compositions above were used to style curled hair switches. After one hour all the curled switch treated with the composition of the invention retained their curl.

- 15 Hair switches (7g per switch) were wet by placing for 30 seconds under metered tap water 35°C at a flow rate of 4L/min. 0.7g Sun Silk shampoo was spread (0.1g shampoo per 1g hair switch) along the length of each switch and massaged for 30 seconds, followed by rinsing for 60 seconds. Excess water was removed from the switches.

20

Each switch was combed through followed by application of 0.35 example formulation (0.05g example formulation per 1g switch) along the length of the switches. Each switch was combed again.

- 25 12 sensory panellists assessed the switches for sticky feel. The lower the score the higher sticky feeling of the hair.

Table 3

Example	Mean	Standard deviation
Example A	38	21.2
Example B	33	20.7
Example 1	55	16.3
Example 2	57	18.2

- 5 Compositions of the invention felt less sticky than the comparative conventional styling creams. Furthermore, addition of a styling polymer to compositions of the invention do not significantly increase the sticky feeling of hair treated therewith.

- 20 -

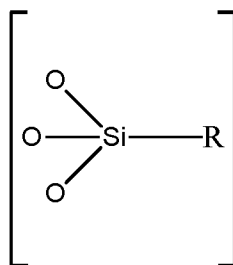
CLAIMS

1. A method of styling hair comprising the step of applying to the hair a composition comprising an emulsion comprising:
- 5 a) hydrophobically modified particles selected from the group consisting of silica, metal oxide and mixtures thereof;
- b) amino functionalised silicone; and
- c) water.

- 10 2. A method according to claim 1 in which the hydrophobically particles comprise silica or titanium oxide.

3. A method according to claim 2 in which the hydrophobically particles comprise silica.

- 15 4. A method according to claim 3 in which the hydrophobically modified silica comprise



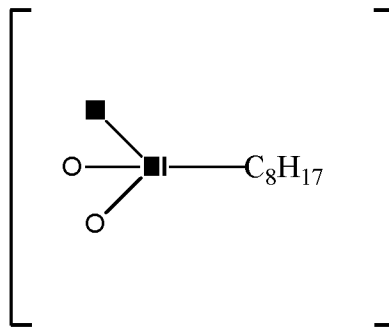
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in which R is a C₄ to C₁₈ alkyl group.

5. A method according to claim 4 in which the hydrophobically modified silica comprises the group:

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- 21 -



6. A method according to any preceding claim in which the hydrophobically modified particle has a primary particle size from 1nm to 100 nm.
- 5
7. A method according to any preceding claim in which the amino functionalized silicone comprises an amino glycol copolymer.
8. A method according to any preceding claim in which the weight ratio of hydrophobically modified particle to amino functionalised silicone is from 3:1 to 1:50.
- 10
9. A method according to any one of the preceding claims wherein the emulsion further comprises at least one non amino functionalised silicone.
- 15
10. A method according to any preceding claim in which the level of hydrophobically modified silica particles is from 0.1 to 10 wt% of the total composition.
- 20
11. A method according to any preceding claim in which the composition further comprises a styling polymer.
12. A process for manufacturing a composition as described in any of the above claims comprising the step of forming a pre-emulsion comprising hydrophobic particles dispersed in the silicone oil (aminosilicone).
- 25

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/071659

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61K8/06 A61K8/25 A61K8/29 A61K8/898 A61Q5/06
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61K A61Q

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

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

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/056623 A1 (AVON PROD INC [US]; GARRISON MARK S [US]; ROBINSON FREDA E [US]; SANDS) 12 May 2011 (2011-05-12) paragraphs [0001] - [0004], [0007], [0013], [0019], [0020], [0058] - [0082], [0110]; example 1b -----	1-12
A,P	WO 2012/061025 A1 (AVON PROD INC [US]; LAMBERTY LISA [US]; KALAFSKY ROBERT E [US]; DUGGAN) 10 May 2012 (2012-05-10) the whole document -----	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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

"&" document member of the same patent family

Date of the actual completion of the international search

6 March 2013

Date of mailing of the international search report

15/03/2013

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/071659

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