Claims

1) A method of reducing or preventing hair frizz, comprising the steps:

I) applying to hair a flowable composition lacking a detersive component; and

II) distributing said composition along a plurality of hair shafts;

wherein the flowable composition comprises a non-volatile component selected from the group consisting of a dimethicone component, a dimethiconol component and a phenyl silicone component, and is selected from:

- a water-containing anti-frizz composition comprising:

a) ~~3.0%~~ 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

b) - silicone-compatible, volatile or non-volatile liquid carrier component,

and

c) water;

- a cationic oil-in-water anti-frizz emulsion comprising:

a) 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

b) an optional silicone-compatible, volatile or non-volatile liquid carrier component,

c) an optional alkylsiloxysilicate component, and

d) water;

- a non-ionic oil-in-water emulsion comprising:

a) ~~3.0%~~ 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

b) an optional a silicone-compatible, volatile or non-volatile liquid carrier component,

c) a fatty alcohol or non-ionic derivative thereof, and

d) water; and

- a non-ionic water-in-oil anti-frizz emulsion comprising:

a) ~~3.0%~~ 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

a) an optional silicone-compatible, volatile or non-volatile liquid carrier component,

b) a non-ionic fatty alcohol, and

c) water;

wherein said flowable composition provides at least an 80% reduction in hair frizz when frizzy hair is

contacted with the flowable composition and subsequently maintained at 80° F and 80% humidity for 6 hours, as compared to frizzy hair otherwise identically treated but not contacted with the flowable composition, and wherein reduction in hair frizz is measured by digital image analysis of said frizzy hair contacted with the flowable composition and said frizzy hair not contacted with the flowable composition at the end of said 6 hour time period.

~~2) A method according to claim 1 which, when applied to frizzy hair and permitted to dry, causes a reduction in hair frizz after incubation at 80° F and 80% humidity for 6 hours as compared to the hair frizz of untreated, otherwise identical frizzy hair incubated under identical conditions.~~

~~3~~ 2) The use of a composition lacking a detersive component and comprising a non-volatile component selected from the group consisting of a dimethicone component, a dimethiconol component and a phenyl silicone component to reduce hair frizz by applying the composition to frizzy hair, said reduction being measured relative to untreated, otherwise identical frizzy hair after both the treated frizzy hair and the untreated frizzy hair are incubated at 80° F and 80% humidity for 6 hours;
wherein the composition is selected from:

- a water-containing anti-frizz composition comprising:
a) ~~3.0%~~ 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,
b) an optional silicone-compatible, volatile or non-volatile liquid carrier component, and
c) water;

- a cationic oil-in-water anti-frizz emulsion comprising:
a) 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,
b) an optional silicone-compatible, volatile or non-volatile liquid carrier component,
c) an optional alkylsiloxysilicate component, and
d) water;

- a non-ionic oil-in-water emulsion comprising:
a) ~~3.0%~~ 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,
b) an optional a silicone-compatible, volatile or non-volatile liquid carrier component,
c) a fatty alcohol or non-ionic derivative thereof, and
d) water; and

- a non-ionic water-in-oil anti-frizz emulsion comprising:

a) ~~3.0%~~ 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

b) an optional silicone-compatible, volatile or non-volatile liquid carrier component,

c) a non-ionic fatty alcohol, and

d) water.

~~4~~ 3) A use according to claim ~~3~~ 2 wherein the reduction in hair frizz is at least 80% ~~70%~~, as measured by digital image analysis of said treated frizzy hair and said untreated frizzy hair at the end of said 6 hour time period.

~~5~~ 4) A water-containing anti-frizz composition lacking a detersive component and comprising a non-volatile component selected from the group consisting of a dimethicone component, a dimethiconol component and a phenyl silicone component, comprising:

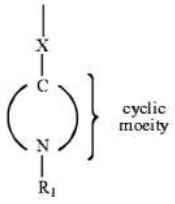
a) ~~3.0%~~ 2.5% or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

b) an optional silicone-compatible, volatile or non-volatile liquid carrier component, and

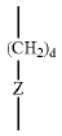
c) water;

wherein said flowable composition provides at least an 80% reduction in hair frizz when frizzy hair is contacted with the flowable composition and subsequently maintained at 80° F and 80% humidity for 6 hours, as compared to frizzy hair otherwise identically treated but not contacted with the flowable composition, and wherein reduction in hair frizz is measured by digital image analysis of said frizzy hair contacted with the flowable composition and said frizzy hair not contacted with the flowable composition at the end of said 6 hour time period.

~~6~~ 5) A composition according to claim ~~5~~ 4 wherein said hindered amine side chains have the general formula, pendant from an Si atom in the polysiloxane side chain:

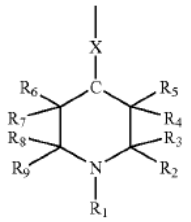


wherein R1 is an H, OH, or a C_1-C_5 hydrocarbon; X is a C_1-C_{10} hydrocarbon, a heteroatom or

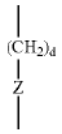


wherein Z is a heteroatom and d is 0 to ~~about~~ 6; preferably wherein the cyclic moiety comprises a piperidinyl or pyrrolidinyl moiety; preferably wherein said polysiloxane fluid component comprises a propoxytetramethyl piperidinyl dimethicone component.

~~7~~ 6) A composition according to claim ~~5~~ 4 wherein ~~wherein~~ said plurality of side chains has the following structure:



wherein R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8 and R_9 are independently an H, a C_1-C_{10} hydrocarbon, an ester, carboxyl or a halogen, and X is a C_1-C_{10} hydrocarbon, a heteroatom, or



wherein Z is a heteroatom and d is 0 to ~~about~~ 6.

~~8~~ 7) A composition according to any of claims ~~5 to 7~~ 4 to 6 comprising an alkylsiloxysilicate component, preferably wherein the alkylsiloxysilicate component comprises a compound selected from the group consisting of a trimethylsiloxysilicate component, a phenylpropyldimethylsiloxysilicate component, and mixtures thereof, preferably wherein the alkylsiloxysilicate component comprises a trimethylsiloxysilicate component; suitably wherein said trimethylsiloxysilicate component is comprised in a trimethylsiloxysilicate-based resin silicone polymer.

~~9~~ 8) A composition according to any of claims ~~5 to 8~~ 4 to 7 wherein the silicone-compatible, volatile or nonvolatile liquid carrier comprises a component selected from the group consisting of: a siloxy component; a hydrocarbon; and an alcohol; preferably wherein the siloxy component comprises a low molecular weight component selected from one or more of: a dimethicone, a dimethiconol, a phenyl

methicone, a phenyl methiconol, a phenyl trimethicone, a diphenyl dimethicone, a phenyl dimethicone, a diphenylsiloxy phenyl trimethicone, a hexamethylsiloxane, a disiloxane, a trisiloxane, cyclotetrasiloxane, cyclopentasiloxane, cyclohexasiloxane.

~~10) A composition according to any of claims 5 to 9 claim which comprises:~~

~~(d) a non-volatile component comprising a component selected from the group consisting of a dimethicone component, a dimethiconol component and a phenyl silicone component.~~

~~11~~ 9) A composition according to any of claims ~~5 to 10~~ 4 to 8 which further comprises one or more components selected from the group consisting of a colorant component, a hair shine ingredient, a sunscreen ingredient, an aesthetic modifier component, an essential oil component, a botanical component, a scent component, a nucleic acid component, a specialty extract component and a vitamin; suitably wherein the aesthetic modifier component is selected from the group consisting of a thickener component, a preservative component, a fragrance component, a pH adjustment component, a plasticizer component, an appearance modifier, and an anti-oxidant component.

~~12~~ 10) A composition according to any of claims ~~5 to 11~~ 4 to 9 wherein

a) said polysiloxane component comprises a propoxytetramethyl piperidinyl dimethicone component, and

b) said silicone-compatible, volatile or non-volatile liquid carrier component comprises a component selected from the group consisting of a dimethicone, a dimethiconol, a phenyl methicone, a phenyl methiconol, a phenyl trimethicone, a diphenyl dimethicone, a phenyl dimethicone, and a diphenylsiloxy phenyl trimethicone, a hexamethylsiloxane, a disiloxane, a trisiloxane, cyclotetrasiloxane, cyclopentasiloxane, cyclohexasiloxane, and a mixture of two or more of these components.

~~13~~ 11) A composition according to any of claims ~~5 to 12~~ 4 to 10 which comprises one or more fatty quaternary ammonium salts, fatty amines and/or fatty alcohols and/or one or more of the following ingredients: cetrimonium chloride, stearalkonim chloride, behentrimonium chloride (also known as docosyltrimethylammonium chloride), behentrimonium methosulfate, dicetyldimonium chloride (also known as diceyl dimethyl ammonium chloride), hydroxypropyltrimonium chloride, ricinoleamidopropyltrimonim chloride ricinoleamidopropyltrimonim ethosulfate, ricinoleamidopropyltrimonim methosulfate, safflowerami dopropyl ethyldimonium ethosulfate, quaternized stearamidopropyl amine, lauryl alcohol, cetyl alcohol, stearyl alcohol, behenyl alcohol~~, and derivatives of any of these~~; and/or which contains containing one or more water-soluble thickener suitably wherein the water-soluble thickener is one or more component selected from the group consisting of cellulose-based thickeners, guar gums, cassia gums, locust bean gums, xanthan gums, acacia senegal gums, caesalpina spinosa gums, a clay, acrylamidopropyltrimonium chloride/acrylates copolymers, derivatized and underivatized carbomers, an

organically modified clay~~, such as quaternized clays~~, and mixtures thereof.

~~14~~ 12) A cationic oil-in-water anti-frizz emulsion lacking a detersive component and comprising a non-volatile component selected from the group consisting of a dimethicone component, a dimethiconol component and a phenyl silicone component, comprising:

a) a polysiloxane fluid component ~~containing a polysiloxane component~~ comprising a plurality of hindered amine side chains,

b) an optional silicone-compatible, volatile or non-volatile liquid carrier component,

c) an optional alkylsiloxysilicate component, and

d) water;

wherein said cationic oil-in-water anti-frizz emulsion provides at least an 80% reduction in hair frizz when frizzy hair is contacted with the cationic oil-in-water anti-frizz emulsion and subsequently maintained at 80° F and 80% humidity for 6 hours, as compared to frizzy hair otherwise identically treated but not contacted with the cationic oil-in-water anti-frizz emulsion, and wherein reduction in hair frizz is measured by digital image analysis of said frizzy hair contacted with the cationic oil-in-water anti-frizz emulsion and said frizzy hair not contacted with the cationic oil-in-water anti-frizz emulsion at the end of said 6 hour time period.

~~15~~ 13) A cationic oil-in-water anti-frizz emulsion according to claim ~~14~~ 12 which comprises a component selected from the group consisting of a quaternary ammonium fatty salt and a fatty amine.

~~16~~ 14) A cationic oil-in-water anti-frizz emulsion according to claim ~~14~~ 12 or claim ~~15~~ 13 wherein said polysiloxane fluid component comprises an alkoxytetramethyl piperidinyl dimethicone and/or a trimethylsiloxysilicate component.

~~17~~ 15) A non-ionic oil-in-water emulsion lacking a detersive component comprising:

a) 2.5% ~~3.0%~~ or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

b) an optional a silicone-compatible, volatile or non-volatile liquid carrier component,

c) a fatty alcohol or non-ionic derivative thereof, and

d) water; and

wherein said oil-in-water emulsion provides at least an 80% reduction in hair frizz when frizzy hair is contacted with the oil-in-water emulsion and subsequently maintained at 80° F and 80% humidity for 6 hours, as compared to frizzy hair otherwise identically treated but not contacted with the oil-in-water emulsion, and wherein reduction in hair frizz is measured by digital image analysis of said frizzy hair contacted with the oil-in-water emulsion and said frizzy hair not contacted with the oil-in-water emulsion at the end of said 6 hour time period.

~~18~~ 16) A non-ionic oil-in-water emulsion according to claim ~~17~~ 15 wherein the polysiloxane fluid component comprises propoxytetramethyl piperidinyl dimethicone and/or wherein said fatty alcohol or non-ionic derivative comprises a fatty ether of a polyethylene glycol.

~~19~~ 17) A non-ionic oil-in-water emulsion according to claim ~~17~~ 15 or claim ~~18~~ 16 which comprises a fatty alcohol and/or a polymer comprising acrylodimethyltaurate subunits and/or a hydroxyethylacrylate/acrylodimethyltaurate copolymer.

~~20~~ 18) A non-ionic water-in-oil anti-frizz emulsion lacking a detersive component and comprising a non-volatile component selected from the group consisting of a dimethicone component, a dimethiconol component and a phenyl silicone component, comprising:

a) 2.5% ~~3.0%~~ or more, by weight, of a polysiloxane fluid component containing a polysiloxane component comprising a plurality of hindered amine side chains,

b) an optional silicone-compatible, volatile or non-volatile liquid carrier component,

c) a non-ionic fatty alcohol, and

d) water; and

wherein said water-in-oil anti-frizz emulsion provides at least an 80% reduction in hair frizz when frizzy hair is contacted with the water-in-oil anti-frizz emulsion and subsequently maintained at 80° F and 80% humidity for 6 hours, as compared to frizzy hair otherwise identically treated but not contacted with the water-in-oil anti-frizz emulsion, and wherein reduction in hair frizz is measured by digital image analysis of said frizzy hair contacted with the water-in-oil anti-frizz emulsion and said frizzy hair not contacted with the water-in-oil anti-frizz emulsion at the end of said 6 hour time period.

~~21~~ 19) A non-ionic water-in-oil anti-frizz emulsion according to claim ~~20~~ 18 which comprises one or more component each independently selected from the group consisting of: a nonionic emulsifier and a water soluble thickener and/or which comprises one or more component each independently selected from the group consisting of: a detangling aid, a hair shine ingredient, a humectant, a sunscreen ingredient, a fragrance component, a plasticizer component, an antioxidant component, an essential oil, a nucleic acid, a protein, an amino acid and a vitamin.

~~22~~ 20) A method or use according to any of claims 1 to ~~4~~ 3 wherein the composition is as defined in any of claims ~~5 to 21~~ 4 to 19.