

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 July 2009 (09.07.2009)

PCT

(10) International Publication Number
WO 2009/086036 A1

(51) International Patent Classification:
A61K 8/81 (2006.01)

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(21) International Application Number:
PCT/US2008/087567

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(22) International Filing Date:
19 December 2008 (19.12.2008)

(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE,
EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID,
IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK,
LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW,
MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT,
RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/017,350 28 December 2007 (28.12.2007) US

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(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,
NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

(54) Title: COMPOSITION CONTAINING A POLAR MODIFIED WAX

(57) Abstract: A physiologically acceptable composition, especially a cosmetic composition, comprising at least one polar modified wax and at least one viscosity increasing agent, as well as to methods of using such compositions. Polar modified waxes for use in the composition include a wax consisting essentially of polypropylene and maleic anhydride units, a wax consisting essentially of C26-C28 alpha olefin and maleic acid anhydride units, and mixtures thereof. Viscosity increasing agents for use in the composition include a polysilicone-polyamide copolymer, a nylon 611/dimethicone copolymer, an A-B polymer or an A-B-A polymer, where A represents a hard segment and B represents a soft segment, such as a polystyrene, and a liposoluble or dispersible rheological polymer, such as polyvinylpyrrolidone.



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TITLE OF THE INVENTION

COMPOSITION CONTAINING A POLAR MODIFIED WAX

FIELD OF THE INVENTION

[0001] The present invention relates to compositions, for example, a cosmetic composition, comprising at least one polar modified wax. Such compositions can possess improved properties and characteristics such as, for example, increased long wear and anti-smudging properties, improved shine/color characteristics and/or better texture and feel upon application.

DISCUSSION OF THE BACKGROUND

[0002] Many cosmetic compositions, including pigmented cosmetics such as foundations, concealers, lipsticks, and mascaras, and other cosmetic and sunscreen compositions, have been developed for longer wear and transfer resistance properties. This is generally accomplished by the use of compositions that form a film after application. Such compositions generally contain volatile solvents, which evaporate on contact with the skin or other keratinous tissue, leaving behind a layer comprising waxes and/or resins, pigments, fillers, and actives. However, these compositions tend to be uncomfortable for the wearer as the composition remains on the skin or other keratinous tissue as a brittle or non-flexible film. Such compositions may not be pliable or soft, and they may not be comfortable to wear. Furthermore, such compositions have a tendency to be tacky, resulting in poor application, spreadability and wear characteristics.

[0003] Thus, there remains a need for improved cosmetic compositions having improved cosmetic properties.

[0004] Accordingly, one aspect of the present invention is a care and/or makeup and/or treatment composition for keratinous material such as skin, hair, eyes, eyelashes, nails and/or lips, which is able to address or overcome at least one of the aforementioned problems with the prior art compositions.

SUMMARY OF THE INVENTION

[0005] The present invention relates to compositions, preferably cosmetic compositions, comprising at least one polar modified wax.

[0006] The present invention also relates to colored cosmetic compositions comprising at least one coloring agent and at least one polar modified wax. Such colored cosmetic compositions can be, for example, anhydrous lip compositions (for example, eye shadow, lipstick or liquid lip colors) or foundations.

[0007] The present invention further relates to colored cosmetic compositions comprising at least one polar modified wax, at least one coloring agent and water. Preferably the compositions further comprise at least one volatile oil. Such water-containing colored cosmetic compositions are preferably foundations or mascaras, and are emulsions or dispersions.

[0008] The present invention also relates to methods of treating, caring for and/or making up keratinous material (for example, skin, eyes, eyelashes or lips) by applying compositions of the present invention to the keratinous material in an amount sufficient to treat, care for and/or make up the keratinous material.

[0009] The present invention further relates to covering or hiding skin defects associated with keratinous material (for example, skin or lips) by applying compositions of the present invention to the keratinous material in an amount sufficient to cover or hide such skin defects.

[0010] The present invention also relates to methods of enhancing the appearance of keratinous material (for example, skin, eyes, eyelashes, or lips) by applying compositions of the present invention to the keratinous material in an amount sufficient to enhance the appearance of the keratinous material.

[0011] The present invention further relates to compositions having improved cosmetic properties such as, for example, increased anti-smudging properties, increased long wear properties, improved shine/color characteristics and/or better texture or feel upon application.

[0012] The present invention also relates to methods of increasing both the anti-smudging properties and long wear properties of a composition comprising adding to a composition at least one polar modified wax.

[0013] The present invention also relates to methods of improving the feel or texture properties of a composition upon application to a keratin material comprising adding to a composition (for example, a foundation) at least one polar modified wax.

[0014] The present invention also relates to methods of making a composition comprising adding at least one polar modified wax to a composition.

[0015] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0016] As used herein, the expression "at least one" means one or more and thus includes individual components as well as mixtures/combinations.

[0017] "Film former" or "film forming agent" as used herein means a polymer or resin that leaves a film on the substrate to which it is applied, for example, after a solvent accompanying the film former has evaporated, absorbed into and/or dissipated on the substrate.

[0018] "Transfer resistance" as used herein refers to the quality exhibited by compositions that are not readily removed by contact with another material, such as, for example, a glass, an item of clothing or the skin, for example, when eating or drinking. Transfer resistance may be evaluated by any method known in the art for evaluating such. For example, transfer resistance of a composition may be evaluated by a "kiss" test. The "kiss" test may involve application of the composition to human keratin material such as hair, skin or lips followed by rubbing a material, for example, a sheet of paper, against the hair, skin or lips after expiration of a certain amount of time following application, such as 2 minutes after application. Similarly, transfer resistance of a composition may be evaluated by the amount of product transferred from a wearer to any other substrate, such as transfer from the hair, skin or lips of an individual to a

collar when putting on clothing after the expiration of a certain amount of time following application of the composition to the hair, skin or lips. The amount of composition transferred to the substrate (e.g., collar, or paper) may then be evaluated and compared. For example, a composition may be transfer resistant if a majority of the product is left on the wearer's hair, skin or lips. Further, the amount transferred may be compared with that transferred by other compositions, such as commercially available compositions. In a preferred embodiment of the present invention, little or no composition is transferred to the substrate from the hair, skin or lips.

[0019] "Long wear" compositions as used herein, refers to compositions where color remains the same or substantially the same as at the time of application, as viewed by the naked eye, after an extended period of time. Long wear properties may be evaluated by any method known in the art for evaluating such properties. For example, long wear may be evaluated by a test involving the application of a composition to human hair, skin or lips and evaluating the color of the composition after an extended period of time. For example, the color of a composition may be evaluated immediately following application to hair, skin or lips and these characteristics may then be re-evaluated and compared after a certain amount of time. Further, these characteristics may be evaluated with respect to other compositions, such as commercially available compositions.

[0020] "Tackiness" as used herein refers to the adhesion between two substances. For example, the more tackiness there is between two substances, the more adhesion there is between the substances. To quantify "tackiness," it is useful to determine the "work of

adhesion" as defined by IUPAC associated with the two substances.

Generally speaking, the work of adhesion measures the amount of work necessary to separate two substances. Thus, the greater the work of adhesion associated with two substances, the greater the adhesion there is between the substances, meaning the greater the tackiness is between the two substances.

[0021] Work of adhesion and, thus, tackiness, can be quantified using acceptable techniques and methods generally used to measure adhesion, and is typically reported in units of force time (for example, gram seconds ("g s")). For example, the TA-XT2 from Stable Micro Systems, Ltd. can be used to determine adhesion following the procedures set forth in the TA-XT2 Application Study (ref: MATI/PO.25), revised January 2000, the entire contents of which are hereby incorporated by reference. According to this method, desirable values for work of adhesion for substantially non-tacky substances include less than about 0.5 g s, less than about 0.4 g s, less than about 0.3 g s and less than about 0.2 g s. As known in the art, other similar methods can be used on other similar analytical devices to determine adhesion.

[0022] "Waterproof" as used herein refers to the ability to repel water and permanence with respect to water. Waterproof properties may be evaluated by any method known in the art for evaluating such properties. For example, a mascara composition may be applied to false eyelashes, which may then be placed in water for a certain amount of time, such as, for example, 20 minutes. Upon expiration of the pre-ascertained amount of time, the false eyelashes may be removed from the water and passed over

a material, such as, for example, a sheet of paper. The extent of residue left on the material may then be evaluated and compared with other compositions, such as, for example, commercially available compositions. Similarly, for example, a composition may be applied to skin, and the skin may be submerged in water for a certain amount of time. The amount of composition remaining on the skin after the pre-ascertained amount of time may then be evaluated and compared. For example, a composition may be waterproof if a majority of the product is left on the wearer, e.g., eyelashes, skin, etc. In a preferred embodiment of the present invention, little or no composition is transferred from the wearer.

[0023] The cosmetic compositions and methods of the present invention can comprise, consist of, or consist essentially of the essential elements and limitations of the invention described herein, as well as any additional or optional ingredients, components, or limitations described herein or otherwise useful in personal care compositions intended for topical application to hair.

[0024] The composition of the present invention may be in any form, either liquid or non-liquid (semi-solid, soft solid, solid, etc.). For example, it may be a paste, a solid, a gel, or a cream. It may be an emulsion, such as an oil-in-water or water-in-oil emulsion, a multiple emulsion, such as an oil-in-water-in-oil emulsion or a water-in-oil-in-water emulsion, or a solid, rigid or supple gel, including anhydrous gels. The composition can also be in a form chosen from a translucent anhydrous gel and a transparent anhydrous gel. The composition of the invention may, for example, comprise an external or continuous fatty phase. The composition

may be anhydrous. The composition can also be a molded composition or cast as a stick or a dish. The composition in one embodiment is a solid such as a molded stick or a poured stick.

[0025] Depending on the intended application, such as a stick, hardness of the composition may also be considered. The hardness of a composition may, for example, be expressed in gramforce (gf). The composition of the present invention may, for example, have a hardness ranging from 20 gf to 2000 gf, such as from 20 gf to 900 gf, and further such as from 20 gf to 600 gf.

[0026] This hardness is measured in one of two ways. A first test for hardness is according to a method of penetrating a probe into the composition and in particular using a texture analyzer (for example TA-XT2i from Rheo) equipped with an ebonite cylinder of height 25 mm and diameter 8 mm. The hardness measurement is carried out at 20°C at the center of 5 samples of the composition. The cylinder is introduced into each sample of composition at a pre-speed of 2 mm/s and then at a speed of 0.5 mm/s and finally at a post-speed of 2 mm/s, the total displacement being 1 mm. The recorded hardness value is that of the maximum peak observed. The measurement error is ± 50 gf.

[0027] The second test for hardness is the "cheese wire" method, which involves cutting an 8.1 mm or preferably 12.7 mm in diameter stick composition and measuring its hardness at 20°C using a DFGHS 2 tensile testing machine from Indelco-Chatillon Co. at a speed of 100 mm/minute. The hardness value from this method is expressed in grams as the shear force required to cut a stick under the above conditions. According

to this method, the hardness of compositions according to the present invention which may be in stick form may, for example, range from 30 gf to 300 gf, such as from 30 gf to 250 gf, for a sample of 8.1 mm in diameter stick, and further such as from 30 gf to 200 gf, and also further such as from 30 gf to 120 gf for a sample of 12.7 mm in diameter stick.

[0028] The hardness of the composition of the present invention may be such that the compositions are self-supporting and can easily disintegrate to form a satisfactory deposit on keratin materials. In addition, this hardness may impart good impact strength to the inventive compositions, which may be molded or cast, for example, in stick or dish form.

[0029] The skilled artisan may choose to evaluate a composition using at least one of the tests for hardness outlined above based on the application envisaged and the hardness desired. If one obtains an acceptable hardness value, in view of the intended application, from at least one of these hardness tests, the composition falls within preferred embodiments of the invention.

[0030] As is evident, the hardness of the composition according to preferred embodiments of the invention may, for example, be such that the composition is advantageously self-supporting and can disintegrate easily to form a satisfactory deposit on keratin materials. In addition, with this hardness, the composition of the invention may have good impact strength.

[0031] According to preferred embodiments of the present invention, the composition in stick form may have the behavior of a

deformable, flexible elastic solid, giving noteworthy elastic softness on application.

[0032] As defined herein, stability is tested by placing the composition in a controlled environment chamber for 8 weeks at 25°C. In this test, the physical condition of the sample is inspected as it is placed in the chamber. The sample is then inspected again at 24 hours, 3 days, 1 week, 2 weeks, 4 weeks and 8 weeks. At each inspection, the sample is examined for abnormalities in the composition such as phase separation if the composition is in the form of an emulsion, bending or leaning if the composition is in stick form, melting, or syneresis (or sweating). The stability is further tested by repeating the 8-week test at 25°C, 37°C, 45°C and under freeze-thaw conditions. A composition is considered to lack stability if in any of these tests an abnormality that impedes functioning of the composition is observed. The skilled artisan will readily recognize an abnormality that impedes functioning of a composition based on the intended application.

[0033] POLAR MODIFIED WAX

[0034] According to the present invention, compositions comprising at least one polar modified wax are provided. "Polar modified wax" as used herein refers to waxes made using metallocene catalysis which have been modified to include polar groups or units. Suitable polar modified waxes include those disclosed in U.S. patent application publication no. 20070031361, the entire contents of which is hereby incorporated by reference.

[0035] Preferably, the polar modified wax is based upon a homopolymer and/or copolymer wax of ethylene and/or propylene monomers having a weight-average molecular weight M_w of less than or equal to 25 000 g/mol, preferably of 1000 to 22 000 g/mol and particularly preferably of 4000 to 20,000 g/mol, a number-average molecular weight M_n of less than or equal to 15 000 g/mol, preferably of 500 to 12 000 g/mol and particularly preferably of 1000 to 5000 g/mol, a molar mass distribution M_w/M_n in the range from 1.5 to 10, preferably from 1.5 to 5, particularly preferably from 1.5 to 3 and especially preferably from 2 to 2.5, which have been obtained by metallocene catalysis. In the case of a copolymer wax, it is preferable to have, based on the total weight of the copolymer wax, 0.1 to 30.0% by weight of structural units originating from the one monomer and 70.0 to 99.9% by weight of structural units originating from the other monomer. Such homopolymer and copolymer waxes can be made, for example, by the process described in EP 571 882, the entire contents of which is hereby incorporated by reference, using the metallocene catalysts specified therein. Suitable preparation processes include, for example, suspension polymerization, solution polymerization and gas-phase polymerization of olefins in the presence of metallocene catalysts, with polymerization in the monomers also being possible.

[0036] Polar modified waxes can be produced in a known manner from the homopolymers and copolymers described above by oxidation with oxygen-containing gases, for example air, or by graft reaction with polar monomers, for example maleic acid or acrylic acid or derivatives of these acids. The polar modification of metallocene polyolefin waxes by

oxidation with air is described, for example, in EP 0 890 583 A1, and the modification by grafting is described, for example, in U.S. Pat. No. 5,998,547, the entire contents of both of which are hereby incorporated by reference in their entirety.

[0037] In accordance with the present invention, particularly preferred polar modified waxes are hydrophilically modified waxes (that is, waxes which have been modified to provide the waxes with hydrophilic properties). Suitable examples include, but are not limited to, homopolymers and copolymers of hydrophobic groups such as C2-C30 groups, for example ethylene, propylene, C18-C30, etc. which have been modified with hydrophilic units such as, for example, maleic anhydride, acrylate, methacrylate, polyvinylpyrrolidone (PVP), etc. Particularly preferred hydrophilically modified waxes are ethylene and propylene homopolymers and copolymers which have been modified with acrylate and/or maleic anhydride units. .

[0038] In accordance with the present invention, particularly preferred polar modified waxes also include hydrophobically modified waxes (that is, waxes which have been modified to provide the waxes with hydrophobic properties). Suitable examples include, but are not limited to, hydrophilic homopolymers and copolymers of maleic anhydride, acrylate, methacrylate, polyvinylpyrrolidone (PVP), etc. which have been modified with hydrophobic groups such as C2-C30 groups, for example ethylene, propylene, C18-C30, etc.

[0039] Particularly preferred polar modified waxes for use in the present invention are polypropylene-maleic anhydride modified waxes ("PPMA") commercially available from Clariant under the trade name LICO CARE, and C26-C28 alpha olefin maleic acid anhydride copolymer modified waxes. Such waxes are also known as polypropylene-ethylene-maleic anhydride copolymers and C26-C28 alpha olefin-ethylene-maleic anhydride copolymers due to inclusion of ethylene group(s) resulting from the reaction of the hydrophobic group with the hydrophilic maleic anhydride group. Specific examples of such waxes include products marketed by Clariant under the LicoCare name having designations such as PP207 LP3349, CM401 LP3345, CA301 LP 3346, and CA302 LP 3347.

[0040] According to particularly preferred embodiments in which the composition is a lip composition, it is preferred that the polar modified waxes have low crystallinity as determined by differential scanning calorimetry. Preferably, the polar modified waxes have a crystallinity of less than 40%, more preferably less than 30%, and most preferably less than 25%. For example, LicoCare PP207 LP3349 has approximately 11% crystallinity. Such waxes possess improved clarity which, in turn, results in less reduction in gloss of the lip composition.

[0041] Preferably, the polar modified wax(es) represent from about 0.1% to about 30% of the total weight of the composition, more preferably from about 0.5% to about 20% of the total weight of the composition, and most preferably from about 1% to about 15%, including all ranges and subranges therebetween such as, for example, about 5% to about 15% and about 10% to about 20%.

[0042] Viscosity Increasing Agents

[0043] The composition may also contain elastomeric compounds such as those sold or made under the names KSG6 from Shin-Etsu, Trefil E-505C or Trefil E-506C from Dow-Corning, Gransil from Grant Industries (SR-CYC, SR DMF10, SR-DC556) or those marketed in the form of preconstituted gels (KSG15, KSG17, KSG16, KSG18, KSG21 from Shin-Etsu, Gransil SR 5CYC gel, Gransil SR DMF 10 gel, Gransil SR DC556 gel, SF 1204 and JK 113 from General Electric or emulsifying elastomers such as those sold under the names of KSG-210, KSG-30, KSG-31, KSG-32, KSG-33, KSG-40, KSG 41, KSG-42, KSG-43 and KSG-44 from Shin-Etsu.

[0044] The composition may also contain modified clays such as, for example, hectorites modified with an ammonium chloride of a C₁₀ to C₂₂ fatty acid, such as hectorite modified with distearyldimethylammonium chloride, also known as quaternium-18 bentonite, such as the products sold or made under the names Bentone 34 by the company Rheox, Claytone XL, Claytone 34 and Claytone 40 sold or made by the company Southern Clay, the modified clays known under the name quaternium-18 benzalkonium bentonites and sold or made under the names Claytone HT, Claytone GR and Claytone PS by the company Southern Clay, the clays modified with stearyldimethylbenzoylammonium chloride, known as steralkonium bentonites, such as the products sold or made under the names Claytone APA and Claytone AF by the company Southern Clay, and Baragel 24 sold or made by the company Rheox.

[0045] The composition may also contain silica, such as fumed silica. The fumed silica may have a particle size, which may be nanometric to micrometric, for example ranging from about 5 nm to 200 nm.

[0046] The fumed silicas may be obtained by high-temperature hydrolysis of a volatile silicon compound in a hydrogen-oxygen flame, producing a finely divided silica. This process makes it possible to obtain hydrophilic silicas that have a large number of silanol groups at their surface. Such hydrophilic silicas are sold or made, for example, under the names "Aerosil 130®", "Aerosil 200®", "Aerosil 255®", "Aerosil 300®" and "Aerosil 380®" by the company Degussa, and "CAB-O-SIL HS-55®", "CAB-O-SIL EH-5®", "CAB-O-SIL LM-130®", "CAB-O-SIL MS-55®" and "CAB-O-SIL M-5®" by the company Cabot.

[0047] It is thus possible to chemically modify the surface of the hydrophilic silica by chemical reaction, producing a reduction in the number of silanol groups. The silanol groups can be replaced, for example, with hydrophobic groups: this then gives a hydrophobic silica. The hydrophobic groups may be (a) trimethylsiloxy groups, which are obtained in particular by treating fumed silica in the presence of hexamethyldisilazane. Silicas thus treated are known as "silica silylate" according to the CTFA (6th edition, 1995). They are sold or made, for example, under the references "Aerosil R812®" by the company Degussa and "CAB-O-SIL TS-530®" by the company Cabot; (b) dimethylsiloxy or polydimethylsiloxane groups, which are obtained in particular by treating fumed silica in the presence of polydimethylsiloxane or dimethyldichlorosilane. Silicas thus treated are known as "silica dimethyl silylate" according to the CTFA (6th edition, 1995).

They are sold or made, for example, under the references "Aerosil R972®" and "Aerosil R974®" by the company Degussa, and "CAB-O-SIL TS-610®" and "CAB-O-SIL TS-720®" by the company Cabot; and (c) groups derived from reacting fumed silica with silane alkoxides or siloxanes. These treated silicas are, for example, the products sold or made under the reference "Aerosil R805®" by the company Degussa.

[0048] Using hydrophobic silicas, such as fumed silica, makes can help in obtaining a translucent or even transparent composition, in particular in the form of a stick, which does not exude, in the absence of opacifying particles such as waxes, fillers and pigments (including nacles).

[0049] The composition may also contain at least one typical wax. For the purposes of the present invention, a typical wax is a lipophilic fatty compound that is solid at room temperature (25°C) and atmospheric pressure (760 mmHg, i.e. 101 KPa), which undergoes a reversible solid/liquid change of state, having a melting point of greater than 40°C and further such as greater than 55°C and which may be up to 200°C. By bringing the wax to its melting point, it is possible to make it miscible with oils and to form a microscopically homogeneous mixture, but on returning the temperature of the mixture to room temperature, recrystallization of the wax in the oils of the mixture is obtained. It is this recrystallization in the mixture which is responsible for the reduction in the gloss of the mixture.

[0050] For the purposes of the invention, the waxes are those generally used in cosmetics and dermatology; they are, for example, of natural origin, for instance beeswax, ozokerite, carnauba wax, candelilla wax, ouricury wax, Japan wax, cork fiber wax, sugar cane wax, paraffin wax,

lignite wax, microcrystalline waxes, lanolin wax, montan wax, ozokerites and hydrogenated oils such as hydrogenated jojoba oil as well as waxes of synthetic origin, for instance polyethylene waxes derived from the polymerization of ethylene, waxes obtained by Fischer-Tropsch synthesis, fatty acid esters and glycerides that are solid at 40°C, for example, at above 55°C, fatty alcohol waxes such as those sold by Baker Petrolite under the Performacol name (Performacol 350, 425 and 550) including C30-C50 alcohols, silicone waxes such as alkyl- and alkoxy-poly(di)methylsiloxanes and/or poly(di)methyl-siloxane esters that are solid at 40°C, for example, at above 55°C.

[0051] According to the invention, the melting point values correspond to the melting peak measured by the "Differential Scanning Calorimetry" method with a temperature rise of 5 or 10°C/min.

[0052] The composition may also include a polysilicone-polyamide copolymers such as those disclosed in U.S. patent application publication no. 2004/0170586 (a particularly preferred type of copolymer being a nylon 611/dimethicone copolymer), a tackifier (for example, those sold under the Regalite name), a liposoluble or lipodispersible rheological modifying agent (for example, PVP) and/or a block copolymer such as an A-B or an A-B-A type copolymer (for example, those sold under the Kraton name).

[0053] However, according to particularly preferred embodiments, the compositions contain so little of the viscosity increasing agents discuss above that the presence of such agents does not affect the cosmetic properties of the composition. Preferably, the compositions are

substantially free of such viscosity increasing agents (i.e., contain less than about 1% viscosity increasing agents), essentially free of such viscosity increasing agents (i.e., contain less than about 0.5% viscosity increasing agents) or free of such viscosity increasing agents (i.e., contain less than about 0.1% viscosity increasing agents).

[0054] According to particularly preferred embodiments, the compositions contain so little elastomer and/or wax that the presence of such elastomers and/or waxes does not affect the cosmetic properties of the composition. Preferably, the compositions are substantially free of such elastomers and/or waxes (i.e., contain less than about 0.5% elastomers and/or waxes), essentially free of such elastomers and/or waxes (i.e., contain less than about 0.25% elastomers and/or waxes) or free of such elastomers and/or waxes (i.e., contain less than about 0.1% elastomers and/or waxes).

[0055] VOLATILE OIL

[0056] According to particularly preferred embodiments of the present invention, compositions optionally further comprising at least one volatile oil are provided. Preferably, the at least one volatile oil is a silicone volatile oil, a hydrocarbon volatile oil, or a mixture thereof.

[0057] According to preferred embodiments, the composition may contain one or more volatile silicone oils. Examples of such volatile silicone oils include linear or cyclic silicone oils having a viscosity at room temperature less than or equal to 6cSt and having from 2 to 7 silicon atoms, these silicones being optionally substituted with alkyl or alkoxy groups of 1 to 10 carbon atoms. Specific oils that may be used in the invention include

octamethyltetrasiloxane, decamethylcyclopentasiloxane, dodecamethylcyclohexasiloxane, heptamethyloctyltrisiloxane, hexamethyldisiloxane, decamethyltetrasiloxane, dodecamethylpentasiloxane and their mixtures. Other volatile oils which may be used include KF 96A of 6 cSt viscosity, a commercial product from Shin Etsu having a flash point of 94°C. Preferably, the volatile silicone oils have a flash point of at least 40°C.

[0058] Non-limiting examples of volatile silicone oils are listed in Table 1 below.

[0059] Table 1

Compound	Flash Point (°C)	Viscosity (cSt)
Octyltrimethicone	93	1.2
Hexyltrimethicone	79	1.2
Decamethylcyclopentasiloxane (cyclopentasiloxane or D5)	72	4.2
Octamethylcyclotetrasiloxane (cyclotetradimethylsiloxane or D4)	55	2.5
Dodecamethylcyclohexasiloxane (D6)	93	7
Decamethyltetrasiloxane(L4)	63	1.7
KF-96 A from Shin Etsu	94	6
PDMS (polydimethylsiloxane) DC 200 (1.5cSt) from Dow Corning	56	1.5
PDMS DC 200 (2cSt) from Dow Corning	87	2
PDMS DC 200 (5cSt) from Dow Corning	134	5
PDMS DC 200 (3St) from Dow Corning	102	3

[0060] Further, a volatile linear silicone oil may be employed in the compositions of the present invention. Suitable volatile linear silicone oils include those described in U.S. patent no. 6,338,839 and WO03/042221, the contents of which are incorporated herein by reference. In one embodiment the volatile linear silicone oil is decamethyltetrasiloxane.

In another embodiment, the decamethyltetrasiloxane is further combined with another solvent that is more volatile than decamethyltetrasiloxane.

[0061] According to other preferred embodiments, the composition may contain one or more non-silicone volatile oils and may be selected from volatile hydrocarbon oils, volatile esters and volatile ethers. Examples of such volatile non-silicone oils include, but are not limited to, volatile hydrocarbon oils having from 8 to 16 carbon atoms and their mixtures and in particular branched C₈ to C₁₆ alkanes such as C₈ to C₁₆ isoalkanes (also known as isoparaffins), isododecane, isodecane, isohexadecane, and for example, the oils sold under the trade names of Isopar or Permethyl, the C₈ to C₁₆ branched esters such as isohexyl or isodecyl neopentanoate and their mixtures. Preferably, the volatile non-silicone oils have a flash point of at least 40°C.

[0062] Non-limiting examples of volatile non-silicone volatile oils are given in Table 2 below.

Table 2

Compound	Flash Point (°C)
Isododecane	43
Isohexadecane	102
Isodecyl Neopentanoate	118
Propylene glycol n-butyl ether	60
Ethyl 3-ethoxypropionate	58
Propylene glycol methylether acetate	46
Isopar L (isoparaffin C ₁₁ -C ₁₃)	62
Isopar H (isoparaffin C ₁₁ -C ₁₂)	56

[0063] The volatility of the solvents/oils can be determined using the evaporation speed as set forth in U.S. patent no. 6,338,839.

[0064] Preferably, the volatile oil(s), when present, represent from about 5% to about 90% of the total weight of the composition, more

preferably from about 10% to about 80% of the total weight of the composition, and most preferably from about 20% to about 75%, including all ranges and subranges therebetween.

[0065] Coloring Agents

[0066] According to particularly preferred embodiments of the present invention, compositions optionally further comprising at least one at least one coloring agent are provided. Preferably, such colored compositions are cosmetic compositions such as, for example, lip compositions (for example, lipstick or liquid lip colors), mascaras, nail polish or foundations.

[0067] According to this embodiment, the at least one coloring agent is preferably chosen from pigments, dyes, such as liposoluble dyes, nacreous pigments, and pearling agents.

[0068] Representative liposoluble dyes which may be used according to the present invention include Sudan Red, DC Red 17, DC Green 6, β -carotene, soybean oil, Sudan Brown, DC Yellow 11, DC Violet 2, DC Orange 5, annatto, and quinoline yellow. The liposoluble dyes, when present, generally have a concentration ranging up to 20% by weight of the total weight of the composition, such as from 0.0001% to 6%.

[0069] The nacreous pigments which may be used according to the present invention may be chosen from white nacreous pigments such as mica coated with titanium or with bismuth oxychloride, colored nacreous pigments such as titanium mica with iron oxides, titanium mica with ferric blue or chromium oxide, titanium mica with an organic pigment chosen from those mentioned above, and nacreous pigments based on bismuth

oxychloride. The nacreous pigments, if present, be present in the composition in a concentration ranging up to 50% by weight of the total weight of the composition, such as from 0.1% to 20%, preferably from 0.1% to 15%, including all ranges and subranges therebetween.

[0070] The pigments, which may be used according to the present invention, may be chosen from white, colored, inorganic, organic, polymeric, nonpolymeric, coated and uncoated pigments. Representative examples of mineral pigments include titanium dioxide, optionally surface-treated, zirconium oxide, zinc oxide, cerium oxide, iron oxides, chromium oxides, manganese violet, ultramarine blue, chromium hydrate, and ferric blue. Representative examples of organic pigments include carbon black, pigments of D & C type, and lakes based on cochineal carmine, barium, strontium, calcium, and aluminum.

[0071] If present, the pigments may be present in the composition in a concentration ranging up to 50 % by weight of the total weight of the composition, such as from 0.5% to 40%, and further such as from 2% to 30%, including all ranges and subranges therebetween. In the case of certain products, the pigments, including nacreous pigments, may, for example, represent up to 50% by weight of the composition.

[0072] Film Forming Agents

[0073] According to particularly preferred embodiments of the present invention, compositions optionally further comprising at least one at least one film forming agent (film former) are provided. Acceptable film forming agents are known in the art and include, but are not limited to, those disclosed in U.S. patent application publication no. 2004/0170586, the entire

contents of which is hereby incorporated by reference. Non-limiting representative examples of such film forming agents include silicone resins such as, for example, MQ resins (for example, trimethylsiloxysilicates), T-propyl silsesquioxanes and MK resins (for example, polymethylsilsesquioxanes), silicone esters such as those disclosed in U.S. Pat. Nos. 6,045,782, 5,334,737, and 4,725,658, the disclosures of which are hereby incorporated by reference, polymers comprising a backbone chosen from vinyl polymers, methacrylic polymers, and acrylic polymers and at least one chain chosen from pendant siloxane groups and pendant fluorochemical groups such as those disclosed in U.S. Pat. Nos. 5,209,924, 4,693,935, 4,981,903, 4,981,902, and 4,972,037, and WO 01/32737, the disclosures of which are hereby incorporated by reference, polymers such as those described in U.S. Pat. No. 5,468,477, the disclosure of which is hereby incorporated by reference (a non-limiting example of such polymers is poly(dimethylsiloxane)-g-poly(isobutyl methacrylate), which is commercially available from 3M Company under the tradename VS 70 IBM), .

[0074] According to preferred embodiments, the film former, when present, is present in the composition in an amount ranging from 0.1% to 30% by weight relative to the total weight of the composition. Preferably, the film former is present in an amount ranging from 0.5% to 20% by weight relative to the total weight of the composition, and more preferably from 2% to 15%, including all ranges and subranges therebetween. One of ordinary skill in the art will recognize that the film former of the present invention may be commercially available, and may come from suppliers in the form of a

dilute solution. The amounts of the film former disclosed herein therefore reflect the weight percent of active material.

[0075] According to particularly preferred embodiments, when a film forming agent is present, the combined amount of the amount of polyorganosiloxane containing polymer(s) and the film forming agents is 30-50% by weight of the entire weight of the composition. In particularly preferred embodiments, the polyorganosiloxane containing polymer is a silicone-polyamide copolymer and the film forming agent is a silicone resin, in particular trimethylsiloxysilicate, methylsilsesquioxane or propylsilsesquioxane.

[0076] According to preferred embodiments of the present invention, the compositions of the present invention are anhydrous. By "anhydrous," it is meant that the composition contains substantially no water (that is, less than about 0.5% by weight of the composition of water).

[0077] According to preferred embodiments, an anhydrous composition, preferably a mascara, is provided. According to such embodiments, it is preferred to prepare such compositions by solubilizing the polar modified wax in an oil (such as, for example, a volatile oil such as isododecane, an ester such as isononyl isononanoate, or hydrogenated polydecene such as that sold under the trade name PureSyn 2) under high shear.

[0078] According to particularly preferred anhydrous embodiments, low Mw polar modified waxes can be used. For example, polar modified waxes having a Mw of less than 10,000 preferably less than

7,000, and most preferably less than about 3,000 (for example, 2,025) can be used.

[0079] According to other preferred embodiments, the compositions of the present invention further comprise water. In this embodiment, water is preferably present in an amount ranging from about 0.6 to about 70 %, preferably from about 3.0 to 60%, and more preferably from about 5 to about 50 % relative to the total weight of the composition. Preferably, such water-containing cosmetic compositions are lip compositions (for example, lipstick or liquid lip colors), foundations or mascaras, and are emulsions or dispersions.

[0080] According to particularly preferred embodiments, the compositions of the present invention are in the form of an emulsion. Suitable emulsion forms include but are not limited to oil-in-water, water-in-oil, oil-in-water-in-oil, water-in-oil-in-water and nanoemulsions (emulsions whose oil globules are of very fine particle size, that is to say that they have a number-average size of less than about 100 nanometers (nm)). Emulsions contain at least one oil phase and at least one aqueous phase. Typically speaking, emulsions contain surfactants or surfactant-like materials which provide stability to the emulsions and inhibit de-phasing of the emulsions.

[0081] According to preferred embodiments, emulsion compositions can be easily removed from the keratin material to which they have been applied (for example, they are washable).

[0082] One particularly preferred embodiment of the present invention is a composition for application to keratin materials which is an

emulsion but which is substantially free of surfactant (that is, less than 4% of surfactant) or essentially free of surfactant (that is, less than 2% surfactant). According to a particularly preferred embodiment, the emulsion contains only one surfactant.

[0083] If surfactants are present, preferred surfactants include O/W surfactants such as those sold under the names Tween 20, Inutec and Amphisol K.

[0084] Another particularly preferred embodiment of the present invention is a composition for application to keratin materials (hair or eyelashes) which is an emulsion but which is substantially free of TEA-stearate (that is, less than 0.25% of TEA-stearate) or free of TEA Stearate (that is, less than 0.05% TEA-stearate).

[0085] Additional additives

[0086] The composition of the invention can also comprise any additive usually used in the field under consideration. For example, dispersants such as poly(12-hydroxystearic acid), antioxidants, essential oils, sunscreens, preserving agents, fragrances, fillers, neutralizing agents, cosmetic and dermatological active agents such as, for example, emollients, moisturizers, vitamins, essential fatty acids, surfactants, pasty compounds and mixtures thereof can be added. A non-exhaustive listing of such ingredients can be found in U.S. patent application publication no. 2004/0170586, the entire contents of which is hereby incorporated by reference. Further examples of suitable additional components can be found in the other references which have been incorporated by reference in this application. Still further examples of such additional ingredients may be

found in the *International Cosmetic Ingredient Dictionary and Handbook* (9th ed. 2002).

[0087] A person skilled in the art will take care to select the optional additional additives and/or the amount thereof such that the advantageous properties of the composition according to the invention are not, or are not substantially, adversely affected by the envisaged addition.

[0088] These substances may be selected variously by the person skilled in the art in order to prepare a composition which has the desired properties, for example, consistency or texture.

[0089] These additives may be present in the composition in a proportion from 0% to 99% (such as from 0.01% to 90%) relative to the total weight of the composition and further such as from 0.1% to 50% (if present), including all ranges and subranges therebetween.

[0090] Needless to say, the composition of the invention should be cosmetically or dermatologically acceptable, i.e., it should contain a non-toxic physiologically acceptable medium and should be able to be applied to the eyelashes of human beings.

[0091] Non-limiting examples of such additional components include non-volatile oils such as silicone oils (for example, dimethicone, phenyl trimethicone, trimethyl pentaphenyl trisiloxane, etc) or hydrocarbon oils (for example, esters). In one embodiment of the present invention, the compositions of the present invention are substantially free of silicone oils (i.e., contain less than about 0.5 % silicone oils). In another embodiment, the compositions are substantially free of non-silicone oils (i.e., contain less than about 0.5% non-silicone oils). In another embodiment, the

compositions are substantially free of non-volatile oils (i.e., contain less than about 0.5% non-volatile oils).

[0092] According to preferred embodiments of the present invention, methods of treating, caring for and/or making up keratinous material such as skin, lips, hair and mucous membranes by applying compositions of the present invention to the keratinous material in an amount sufficient to treat, care for and/or make up the keratinous material are provided. Preferably, "making up" the keratin material includes applying at least one coloring agent to the keratin material in an amount sufficient to provide color to the keratin material.

[0093] According to other preferred embodiments, methods of covering or hiding defects associated with keratinous material such as imperfections or discolorations by applying compositions of the present invention to the keratinous material in an amount sufficient to cover or hide such defects are provided.

[0094] According to yet other preferred embodiments, methods of enhancing the appearance of keratinous material by applying compositions of the present invention to the keratinous material in an amount sufficient to enhance the appearance of the keratinous material are provided.

[0095] In accordance with the three preceding preferred embodiments, the compositions of the present invention comprising at least one polar modified wax are applied topically to the desired area of the keratin material in an amount sufficient to treat, care for and/or make up the keratinous material, to cover or hide defects associated with keratinous

material, skin imperfections or discolorations, or to enhance the appearance of keratinous material. The compositions may be applied to the desired area as needed, preferably once or twice daily, more preferably once daily and then preferably allowed to dry before subjecting to contact such as with clothing or other objects (for example, a glass or a topcoat). Preferably, the composition is allowed to dry for about 1 minute or less, more preferably for about 45 seconds or less. The composition is preferably applied to the desired area that is dry or has been dried prior to application, or to which a basecoat has been previously applied. Most preferably, the composition further comprises at least one coloring agent, at least one film forming agent, at least one viscosity increasing agent and/or at least one volatile oil.

[0096] According to a preferred embodiment of the present invention, compositions having improved cosmetic properties such as, for example, improved feel upon application (for example, texture, reduced drag or tackiness), increased anti-smudging properties, shine/color characteristics and/or increased long wear properties are provided.

[0097] According to further embodiments of the present invention, methods of improving the viscoelastic properties of a composition comprising adding at least one polar modified wax to the composition are provided. In accordance with this embodiment, the at least one polar modified is present in amounts sufficient to achieve the desired result.

[0098] According to other embodiments of the present invention, methods of improving the anti-smudging, transfer-resistance and/or long wear properties of a composition, comprising adding at least one polar modified wax to the composition are provided. In accordance with this

embodiment, the at least one polar modified is present in amounts sufficient to achieve the desired result.

[0099] According to further embodiments of the present invention, methods of improving the feel or texture of a composition, preferably a makeup compositions such as a foundation or lip composition, comprising adding at least one polar modified wax to the composition are provided. In accordance with this embodiment, the at least one polar modified wax is present in amounts sufficient to achieve the desired result.

[00100] According to yet other embodiments of the present invention, methods of making a composition comprising mixing together at least one other ingredient and at least one polar modified wax to form a composition are provided. In particularly preferred embodiments, the polar modified wax is in an aqueous phase, and the other ingredient is in an oil phase, and the other ingredient and the polar modified wax are combined when the aqueous phase and the oil phase are combined. Such preferred procedures allow, among other things, the preparation of emulsions which can be substantially or essentially free of surfactants.

[00101] Unless otherwise indicated, all numbers expressing quantities of ingredients, reaction conditions, and so forth used in the specification and claims are to be understood as being modified in all instances by the term "about." Accordingly, unless indicated to the contrary, the numerical parameters set forth in the following specification and attached claims are approximations that may vary depending upon the desired properties sought to be obtained by the present invention.

[00102] Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the invention are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contain certain errors necessarily resulting from the standard deviation found in their respective measurements. The following examples are intended to illustrate the invention without limiting the scope as a result. The percentages are given on a weight basis.

[00103] Examples

[00104] Example 1&2 – Foundation

	Trade name	INCL Name	EX1	EX2
A1	DC-245	Cyclopentasiloxane	33.91	33.91
A1	PSPA	NYLON-611/DIMETHICONE COPOLYMER	0.5	0.5
A2	KF-6028	KF-6028	2.4	2.4
A2	Bentone	DISTEARDIMONIUM HECTORITE	0.94	0.94
A2	expancel 5551	Acrylate Copolymer	0.25	0.25
A2	KSG 710	Dimethicone and Dimethicon/Polyglycerin	6	6
B1		Pigment Grind	12	12
C1	Sunsphere H 51	Silica	3	3
C1	Orgasol 2002	Nylon 12	1	1
D1	Glycerin	Glycerin	5	5
D1	Phenoxyethanol	Phenoxyethanol	0.8	0.8
D1	CM401	C26-C28 ALPHA OLEFIN MALEIC ACID ANHYDRIDE COPOLYMER	14	8
D1	DI Water	DI Water	17.7	23.7
D1		Simethicone	0.1	0.1
D1	Amphisol k	POTASSIUM CETYL PHOSPHATE	2.4	2.4
		Total	100	100

[00105] Example 1 was crumbly in form. Example 2 was mousse-like in form.

[00106] Example 3,4 and 5 – Long wear and transfer resistance foundations

Trade Name	INCI Name	EX3	EX4	EX5
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A1	isododecane	isododecane	35.6	35.6	35.6
A1	PP207	Propylene-Ethylene-Maleic Anhydride Copolymer	0	4	0
	CM401	C26-28 alpha olefin maleic acid anhydride wax	0	0	4
	PE400	Polyethylene 400 Wax	4	0	0
A1	regalite	HYDROGENATED STYRENE/METHYL STYRENE/INDENE COPOLYMER	10	10	10
A2	Bentone	DISTEARDIMONIUM HECTORITE	1.2	1.2	1.2
		acrylate copolymer	0.2	0.2	0.2
A3	KF-6028	PEG-9 POLYDIMETHYLSILOXYETHYL DIMETHICONE (and) PEG-9	2.5	2.5	2.5
A3		Pigment grind	11.5	11.5	11.5
A3	KSG 710	Dimethicone and Dimethicone/Polyglycerin-3 Crosspolymer	4	4	4
A4	ORGASOL 2002	Nylon-12	1.5	1.5	1.5
	sodium chloride	sodium chloride	1	1	1
	disodium edta	disodium edta	0.2	0.2	0.2
B	Glycerin	Glycerin	3	3	3
B	PHENONIP	Phenoxyethanol etc.	0.8	0.8	0.8
B	DI WATER	DI WATER	24.5	24.5	24.5
		total:	100	100	100

[00107] Example 3 did not contain a polar modified wax. In contrast, examples 4 and 5 contained a polar modified wax. Examples 4 and 5 possessed more transfer resistance and better (longer) wear properties than example 3.

[00108] Example 6 – Washable Mascara (emulsion)

INCI Name	EX6
Isododecane	35.1
Nylon-611/Dimethicone Copolymer	1.5
Iron Oxide	6
DI Water	42
Potassium Cetyl Phosphate	2
Methylparaben	0.25
Propylparaben	0.05
Propylene-Ethylene-Maleic Anhydride Copolymer (LicoCare PP 207 LP1332)	12
Phenoxyethanol (and) Methylparaben (and) Isopropylparaben (and) Isobutylparaben (and) Butylparaben	1.1
Total	100

[00109]

[00110] Example 7&8 – Shiny and Long wear Mascara

INCI Name	EX7	EX8
Isododecane	34.6	31.6
Nylon-611/ Dimethicone Copolymer	3	3
Iron Oxide	6	6
DI Water	38	36
Potassium Cetyl Phosphate	2	2
Propylene-Ethylene-Maleic Anhydride Copolymer (LicoCare PP 207 LP1332)	10	10
Polyvinylpyrrolidone	5	10
Methylparaben	0.25	0.25
Propylparaben	0.05	0.05
Phenoxyethanol (and) Methylparaben (and) Isopropylparaben (and) Isobutylparaben (and) Butylparaben	1.1	1.1
TOTAL	100	100

[00111] Example 9,10,11&12 -- Lip Gloss

	Trade Name	INCI Name	EX9	EX10	EX11	EX12
A	Kraton polymer G1657 m	Polystyrene/Polylethylenebutylene/Polystyrene	8.00	8.00	8.00	8.00
	Regalite R1100	hydrogenated styrene/methyl styrene/indiene	16.00	16.00	16.00	16.00
	polysilane lite	polyisobutene	33.20	33.20	33.20	33.20
B	Iso propyl palmitate	Iso propyl palmitate	6.00	6.00	6.00	6.00
	DC556	phenyl trimethicone	9.80	9.80	9.80	9.80
	DC 555	trimethyl pentaphenyl trisiloxane	10.00	10.00	10.00	10.00
	PURESYN6	polydecene	8.00	8.00	8.00	8.00
	PURESYN150	polydecene	6.00	6.00	6.00	6.00
C	fumed silica	fumed silica	3.00	0.00	0.00	0.00
	LicoCare PP 201 LP 3332	poly propylene wax	0.00	3.00	0.00	0.00
	LicoCare PP 203 LP 3334	poly propylene wax	0.00	0.00	3.00	0.00
	LicoCare PP 207 LP1332	poly propylene-Maleic Anhydride wax	0.00	0.00	0.00	3.00
		total=	100.00	100.00	100.00	100.00

[00112] Example 9 contained fumed silica, and resulted in a composition which was not clear and which was very sticky (tacky) upon

application. Examples 9 and 10 contained non-polar waxes, not polar modified waxes. These compositions were clear but tacky. Example 12, representative of the invention compositions, contained a polar modified wax. Example 12 was both clear and non-tacky.

WHAT IS CLAIMED IS:

1. A composition comprising at least one polar modified wax and at least one viscosity increasing agent.
2. The composition of claim 1, wherein the composition is an emulsion.
3. The composition of claim 1, wherein the composition is anhydrous.
4. The composition of claim 1, further comprising at least one coloring agent.
5. The composition of claim 1, wherein the viscosity increasing agent is a polysilicone-polyamide copolymer.
6. The composition of claim 5, wherein the viscosity increasing agent is a nylon 611/dimethicone copolymer.
7. The composition of claim 1, wherein the viscosity increasing agent is an A-B polymer or an A-B-A polymer, where A represents a hard segment and B represents a soft segment.
8. The composition of claim 7, wherein the polymer comprises polystyrene.
9. The composition of claim 1, wherein the viscosity increasing agent is a liposoluble or dispersible rheological polymer.
10. The composition of claim 9, wherein the at least one liposoluble or dispersible rheological polymer is polyvinylpyrrolidone.
11. The composition of claim 1, wherein the at least one polar modified wax is selected from the group consisting of a wax consisting essentially of

polypropylene and maleic anhydride units, a wax consisting essentially of C26-C28 alpha olefin and maleic acid anhydride units, and mixtures thereof.

12. The composition of claim 1, wherein the at least one polar modified wax is a wax consisting essentially of polypropylene and maleic anhydride units.
13. The composition of claim 1, wherein the at least one polar modified wax is a wax consisting essentially of C26-C28 alpha olefin and maleic acid anhydride units.
14. A method of making up skin comprising applying the composition of claim 1 to the skin.
15. A method of making up lips comprising applying the composition of claim 1 to the lips.
16. A method of making up eyelashes comprising applying the composition of claim 1 to the eyelashes.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/87567

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61K 8/81 (2009.01)

USPC - 424/70.11

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)

IPC(8) - A61K 8/81 (2009.01)

USPC - 424/70.11

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

IPC(8) - A61K 8/81; A61Q 5/00, 7/00, A61K 8/72 (2009.01)

USPC - 424/70.11 (keyword delimited)

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

PubWest (PGPB,USPT,USOC,EPAB,JPAB); Google

Search Terms Used: polysilicone polyamide copolymer, nylon 611 dimethicone, viscosity increasing agent, cm401, C26-C28 alpha olefin maleic anhydride polar modified wax increase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2007/0031361 A1 (HERRMANN et al.) 08 February 2007 (08.02.2007), para [0026]-[0195]	1-16
Y	US 2007/0212315 A1 (PASTOR et al.) 13 September 2007 (13.09.2007), para [0021]-[0043]	1-16
Y	US 2003/0082218 A1 (ICHINOHE et al.) 01 May 2003 (01.05.2003), para [0011]	11, 12
Y	US 2006/0188459 A1 (HEINRICHS et al.) 24 August 2006 (24.08.2006), abstract	13
A	US 2006/0104940 A1 (HEINRICHS et al.) 18 May 2006 (18.05.2006), abstract; para [0009]-[0080]	1-16

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

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

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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

04 February 2009 (04.02.2009)

Date of mailing of the international search report

27 FEB 2009

Name and mailing address of the ISA/US

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