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(54) Title: USE OF COSMETIC COMPOSITION

(57) Abstract: Disclosed is use of a cosmetic composition for enhancing opacity, long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C.

USE OF COSMETIC COMPOSITION

FIELD OF THE INVENTION

The present invention relates to use of a cosmetic composition for enhancing opacity, long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C.

BACKGROUND OF THE INVENTION

Usually, consumers have some skin problems including dryness, wrinkles and fine lines, loose/saggy skin and age spots. Composition comprising film-forming polymer may be one solution for consumers to these problems. Film-forming polymer would form a film onto the skin after applying topically and bring immediate firming effect to the skin. Some beneficial agents, for example optical particle and sunscreen agent, may also be delivered onto skin surface together with the film-forming polymer.

There is an increasing interest to develop a skin care composition comprising a film-forming polymer.

US patent application with publication number of US 2008/0233075 A1 disclosed a topical composition comprising a water-soluble film-forming polymer, a bimodal copolymer comprising a first polymeric component with anionic functional groups and a second polymeric component with cationic functional groups, and one or more biological polymers that are derived from a source selected from the group consisting of animals, plants, algae, fungi, and bacteria or are biotechnologically synthesized. Such a topical composition was said to be applied to saggy or wrinkled skin for enhancing the appearance of the skin.

However, after applying cosmetic composition, the skin may undergo water washing and abrasion by hand and therefore the film formed by film-forming polymer on the skin may be easily washed away and/or rubbed away and therefore lose the benefits.

Meanwhile, the beneficial agent would be easily washed off and/or rubbed off and thus can not provide a long-lasting benefit.

Therefore, the present inventors have recognized a need to improve wash-off resistance, abrasion resistance, and/or long-lasting opacity. Therefore, this invention is directed to use of a cosmetic composition for enhancing opacity, long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C.

SUMMARY OF THE INVENTION

In a first aspect, the present invention provides use of a cosmetic composition for enhancing opacity, long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C.

In a second aspect, the present invention provides a method for enhancing long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the method comprising the step of topically applying to skin a cosmetic composition, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C.

All other aspects of the present invention will more readily become apparent upon considering the detailed description and examples which follow.

DETAILED DESCRIPTION OF THE INVENTION

Except in the examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use may optionally be understood as modified by the word “about”.

All amounts are by weight of the composition, unless otherwise specified.

It should be noted that in specifying any range of values, any particular upper value can be associated with any particular lower value.

For the avoidance of doubt, the word “comprising” is intended to mean “including” but not necessarily “consisting of” or “composed of”. In other words, the listed steps or options need not be exhaustive.

The disclosure of the invention as found herein is to be considered to cover all embodiments as found in the claims as being multiply dependent upon each other irrespective of the fact that claims may be found without multiple dependency or redundancy.

“Film-forming polymer” as used herein refers to polymer which is capable of forming cohesive and continuous covering over the hair and/or skin when applied to their surface.

“Silicone resin” as used herein refers to silicone material which is formed by branched, and/or cage-like oligosiloxanes having three-dimensional structure. Typically, the silicone resin is rigid.

“Lipid” as used herein refers to a class of naturally occurring organic compounds or their analogues which is insoluble in water. Insoluble in water refers to compound that dissolves in water to give a solution with a concentration of less than 5% by weight of the solution, preferably less than 1% and more preferably less than 0.1% by weight of the solution. Typically, the lipid includes fatty acid, soap, fatty ester, wax, fatty alcohol, phospholipid, eicosonoid, terpene, steroid, ceramide and lipid-soluble vitamins.

“Wax” as used herein refers to a class of organic compounds that characteristically comprise long alkyl chains. Typically the waxes are plastic (malleable) at about 25°C. “Wax ester” as used herein means ester which is comprised by a wax.

“Contact angle” (CA), as used herein, means the angle at which a water/vapor interface meets a solid surface at a temperature of 25°C. Such an angle may be measured with a goniometer or other water droplet shape analysis systems with water droplet of 5 µl and at 25°C.

"Melting point" as used herein is the temperature at which it changes state from solid to liquid at atmospheric pressure. When referring to the melting point of wax, it means the temperature at which the wax began to soften. The melting point of lipid other than wax may be measured for example by method in standard of ISO 6321-2002. The melting point of wax may be measured for example by method in standard of ISO 6244-1982 or by Differential Scanning Calorimetry (DSC) but preferably by method in standard of ISO 6244-1982.

"Optical particle" refers to particle which can impart opacity to skin. "Refractive index values" referred to herein are those determined at a temperature of 25 °C and a wavelength of 589 nm unless otherwise stated.

"Leave-on" as used with reference to compositions herein means a composition that is applied to or rubbed on the skin, and left thereon. "Wash-off" as used with reference to compositions herein means a skin cleanser that is applied to or rubbed on the skin and rinsed off substantially immediately subsequent to application. "Skin" as used herein includes the skin on the face (except eye lids and lips), neck, chest, abdomen, back, arms, underarm area, hands, and legs. Preferably "skin" means skin on the face except eye lids and lips. More preferably, "skin" means skin on cheeks.

"Long-lasting" often refers to the deposition of beneficial agent (for example optical particle) remains at least 30%, preferably at least 50% after flushing by tap water (25°C) for 1 minute.

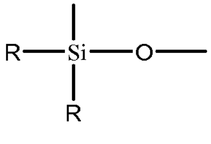
The present invention concerns the use of a cosmetic composition for enhancing opacity, long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C. Beneficial agent as used herein refers to active ingredient which provides a cosmetic and/or therapeutic effect to the skin. Preferably, the beneficial agent comprise optical particle, more preferably is optical particle. Long-lasting opacity is preferably long-lasting whitening.

Opacity as used herein will also include masking/reducing blemishes, even skin tone and/or skin lightening.

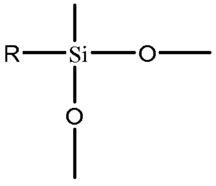
In some preferred embodiments, the composition is neither a cosmetic composition comprising silicone resin, non-volatile silicone oil, and cosmetically acceptable carrier, wherein the non-volatile silicone oil comprises dimethiconol, aminosilicone or a mixture thereof and the weight ratio of the silicone resin to the non-volatile silicone oil is at least 1:4; nor a cosmetic composition comprising a silicone resin, a steroid, and cosmetically acceptable carrier, wherein the weight ratio of silicone resin to steroid is at least 5:9.

The requirement for the film-forming polymers of the present invention is that the film-forming polymer is suitable for use in cosmetic composition. For better performance of wash-off resistance, at least one film-forming polymer preferably has a contact angle of at least 90°, more preferably from 95° to 160°, most preferably from 100° to 120°.

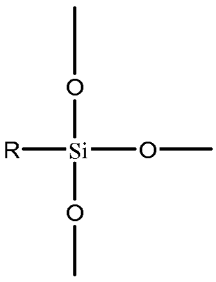
The film-forming polymer may comprise silicone resin, chitosan, or a mixture thereof. More preferably, the first film-forming polymer comprises silicone resin and most preferably is silicone resin. The silicone resin is typically described by the following siloxy monomeric units:



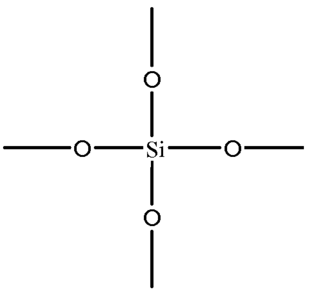
$M=(R)_3SiO_{1/2}$



$D=(R)_2SiO_{2/2}$



$T=RSiO_{3/2}$



$Q=SiO_{4/2}$.

The R group may be selected from saturated or unsaturated hydrocarbon groups. Preferably, the silicone resin of the present invention may be selected from siloxysilicate, silsesquioxane, or a mixture thereof. More preferably, the silicone resin comprises M unit, Q unit, T unit or combination thereof. Even more preferably, the silicone resin comprises MQ silicone resin, T silicone resin, or a mixture thereof.

In some embodiments, the silicone resin preferably comprises MQ silicone resin having the formula of $[(R_1)_3\text{-Si-O}_{1/2}]_a\text{-}(\text{Si-O}_{4/2})_b$, wherein R_1 is mutually identical or different, selected from saturated hydrocarbon groups. R_1 is preferably selected from C_1 to C_6 alkyl, and more preferably each R_1 is methyl group. Thus, the more preferred MQ silicone resin is trimethylsiloxysilicate. Preferably, a and b independently have values ranging from 10 to 1000, and more preferably from 30 to 200.

In another embodiments, the silicone resin preferably comprises T silicone resin having the formula of $[R_2\text{-Si-O}_{3/2}]_x$, wherein R_2 is selected from saturated hydrocarbon groups. R_2 is preferably selected from C_1 to C_6 alkyl, more preferably selected from methyl, ethyl, propyl, butyl, and most preferably propyl. The most preferred T silicone resin is polypropyl silsesquioxane. Preferably, x is less than 2000, more preferably less than 500, but preferably greater than 10, and more preferably greater than 50.

In certain preferred embodiments, the composition comprises MQ silicone resin. Preferably the MQ silicone resin is present in amount of at least 20% by weight of the total silicone resin, more preferably at least 40%, even more preferably at least 70%, and still even more preferably at least 85% by weight of the total silicone resin. Most preferably, MQ silicone resin is present in amount of 100% by weight of the total silicone resin.

In more preferred embodiments, the silicone resin preferably comprises a blend of MQ silicone resin and T silicone resin, the weight ratio of the MQ silicone resin to the T silicone resin is preferably from 1:20 to 20:1 in order to achieve better film-forming performance. More preferably, the weight ratio of the MQ silicone resin to the T silicone resin is from 1:10 to 10:1, even more preferably from 1:5 to 5:1.

Exemplary silicone resin suitable for the present invention includes Dow Corning^{TM} MQ-1640 Flake Resin, a blend of MQ and T Propyl resins, Dow Corning^{TM} MQ-1600

Solid Resin, a 100% active MQ resin, Dow Corning™ 670 Fluid, Cyclopentasiloxane (and) Polypropylsilsesquioxane supplied by Dow Corning.

Preferably, the film-forming polymer is present in the composition in amount of from 0.01 to 20% by weight of the composition, more preferably from 0.2 to 10 %, even more preferably from 0.5 to 7%, and most preferably from 1 to 4% by weight of the composition.

When the composition comprises silicone resin, the silicone resin is present in the composition in amount of from 0.01 to 20% by weight of the composition, more preferably from 0.2 to 10 %, even more preferably from 0.5 to 7%, and most preferably from 1 to 4% by weight of the composition. The weight ratio of silicone resin to the lipid is preferably from 1:10 to 50:1, more preferably from 1:2 to 10:1, even more preferably from 1:1 to 5:1, and most preferably from 2:1 to 4:1.

Without wishing to be bound to any theory or explanation, the present inventors believe that the lipid was embedded into the network of film-forming polymer layer to form a compact film. Such film has stronger binding force to the substrates and improved the performance of wash-off resistance. Therefore, to form a stronger film and/or be better compatible with the film-forming polymer, the lipid preferably has a melting point of at least 10°C, more preferably at least 35°C, even more preferably from 40 °C to 200 °C, and most preferably from 50 °C to 150 °C.

Preferably, the lipid comprises fatty acid, soap, fatty alcohol, fatty ester, wax, steroid, ceramide, or a mixture thereof, more preferably the lipid comprises fatty acid, soap, wax, steroid, ceramide or a mixture thereof, even more preferably the lipid comprises fatty acid, soap, wax, steroid or a mixture thereof and most preferably the lipid comprise fatty acid, soap, wax, or a mixture thereof.

The lipid is preferably present in the composition in amount of from 0.01 to 20% by weight of the composition, more preferably from 0.1 to 10%, even more preferably from 0.2 to 5%, and most preferably from 0.5 to 3% by weight of the composition.

For better performance of wash-off resistance, and/or long-lasting opacity, the weight ratio of film-forming polymer to the lipid is preferably from 1:10 to 50:1, more preferably from 1:2 to 10:1, even more preferably from 1:1 to 5:1, and most preferably from 2:1 to 4:1.

In certain embodiments, the weight ratio of film-forming polymer to the lipid is preferably at least 5:9, more preferably from 3:2 to 35:1, more preferably still from 9:4 to 20:1 even more preferably from 5:2 to 8:1 and most preferably from 8:3 to 5:1.

The fatty acid typically contains fatty acid moieties with chain lengths of from C10 to C30. In certain preferred embodiments, the hydrocarbon chain length of the fatty acid used is from 12 to 24, more preferably 14 to 20, even more preferably 16 to 18 carbon atoms. Suitable fatty acid comprises pelargonic, lauric, myristic, palmitic, isopalmitic, stearic, isostearic, oleic, linoleic, ricinoleic, arachidic, behenic, erucic acid or a mixture thereof. More preferably, the fatty acid comprises stearic, lauric, palmitic, isostearic, myristic acid, or a mixture thereof. Even more preferably, the fatty acid is stearic acid, palmitic acid or a mixture thereof.

Although normally saturated, suitable fatty acid may contain unsaturated fatty acid moieties, and may contain fatty acid moieties having a degree of substitution, such as e. g. hydroxy fatty acids. It is preferred that the fatty acid comprises saturated fatty acid, saturated fatty acid having a degree of substitution, or a combination thereof. More preferably, the fatty acid comprises saturated is selected from saturated fatty acid, saturated fatty acid having a degree of substitution, or a combination thereof. Even more preferably, the fatty acid is saturated fatty acid.

Soap of the present invention is preferably a salt of a C_{10}-C_{30} fatty acid, more preferably C_{12}-C_{24} fatty acid, even more preferably C_{14}-C_{20} fatty acid and most preferably C_{16}-C_{18} fatty acid. Suitable soap comprises pelargonate, laurate, myristate, palmitate, stearate, isostearate, oleate, linoleate, ricinoleate, arachidate, behenate, erucate salt or a mixture thereof. More preferably, the fatty acid salt comprises stearate, laurate, palmitate, isostearate salt or a mixture thereof. Even more preferably, the fatty acid salt is stearate salt, palmitate salt or a mixture thereof.

Preferably the soap is selected from ammonium salt, alkali metal salt or mixture thereof. More preferably, the soap is sodium and/or potassium salt, and most preferably sodium salt. When the lipid comprises fatty acid and soap, it is preferred the lipid comprises fatty acid and salt thereof. More preferably the lipid is a combination of fatty acid and salt thereof.

The requirement of wax is that the wax may be applicable in cosmetic composition. The wax may be natural wax and/or synthetic wax. Such waxes are often selected from hydrocarbon waxes and ester waxes but the wax preferably comprises wax ester. In some preferred embodiments, the wax comprises beeswax, rice bran wax, montan wax, spermaceti wax, carnauba wax, candelilla wax, sugarcane wax, insect wax, petroleum jelly, or a mixture thereof. More preferably, the wax comprises beeswax, rice bran wax, montan wax, carnauba wax, petroleum jelly or a mixture thereof. Even more preferably, the wax is selected from beeswax, petroleum jelly or a mixture thereof. Most preferably, the wax is beeswax. For example, the waxes suitable for use in this invention include beeswax from Koster Keunen Inc.

Representative fatty alcohols comprise from 8 to 40 carbon atoms, more preferably 10 to 32, even more preferably from 12 to 26 and most preferably from 16 to 22. Examples of suitable fatty alcohols include myristyl, pentadecyl, cetyl, stearyl, behenyl and mixtures thereof. More preferably the fatty alcohol is selected from cetyl alcohol, stearyl alcohol, or a mixture thereof.

Fatty ester preferably is the ester of saturated fatty acid having 10 to 30 carbon atoms. Exemplary fatty ester suitable for the present invention includes alkenyl or alkyl esters of fatty acid, preferably having 10 to 24 carbon atoms; ether-esters such as fatty acid esters of ethoxylated saturated fatty alcohols; polyhydric alcohol esters particularly ethylene glycol mono- and di-fatty acid esters, diethylene glycol mono- and di-fatty acid esters.

There is no particular limitation regarding to the steroid of the present invention provided that the steroid is suitable to use in cosmetic composition. Preferably, the steroid comprises hydroxyl group, more preferably comprise a sterol and even more preferably the steroid is a sterol. The sterol may comprise phytosterol, zoosterol, fungi sterol, or a mixture thereof. It is preferred that the sterol comprise zoosterol.

Exemplary sterol includes cholesterol, β-sitosterol, stigmasterol, campersterol, brassicasterol, ergosterol, cholestanol, cholestenone, 7-ketocholesterol, 5α,6α-epoxycholestanol, 5β,6β epoxycholestanol, and 7-dehydrocholesterol, 15-ketocholestene, 15-ketocholestane, 25-hydroxycholesterol, 27-hydroxycholesterol, 24-hydroxycholesterol, 24,25-epoxycholesterol, 24-dihydrolanosterol, lanosterol, or a mixture thereof

It is preferred that the sterol comprises cholesterol, oxysterol, or a mixture thereof. More preferably the sterol comprises cholesterol. The sterol preferably comprises at least 30% of cholesterol by weight of the sterol, more preferably at least 50% by weight, and even more preferably from 80 to 100% by weight of the sterol. Most preferably, the sterol is cholesterol.

When the composition comprises steroid, the steroid is preferably present in the composition in amount of from 0.01 to 10% by weight of the composition, more preferably from 0.05 to 5%, even more preferably from 0.1 to 3%, and most preferably from 0.3 to 1.5% by weight of the composition.

When the composition comprises silicone resin and steroid, the weight ratio of silicone resin to steroid is at least 5:9. For better performance of wash-off resistance, abrasion resistance and/or long-lasting benefits of beneficial agent, the weight ratio of silicone resin to steroid is preferably from 5:7 to 50:1, more preferably from 3:2 to 35:1, more preferably still from 9:4 to 20:1 even more preferably from 5:2 to 8:1 and most preferably from 8:3 to 5:1.

Preferably the cosmetic composition comprises particles which impart opacity to skin, hereafter term “optical particles”. Without being bound to any particular theory or explanation, the present inventor believe that optical particles would be embedded into the film by film-forming polymer and wax. Therefore, the optical particles are able to resistant water and/or friction and deliver the long-lasting opacity to the skin.

The optical particles are typically particles of high refractive index materials. For example the optical particles may have a refractive index of greater than 1.3, more preferably greater than 1.7 and most preferably from 2.0 to 2.7. Examples of such optical particles are those comprising bismuth oxy-chloride, boron nitride, barium sulfate, mica, silica, titanium dioxide, zirconium oxide, iron oxide, aluminium oxide, zinc oxide or combinations thereof. More preferred particles are particles comprising titanium dioxide, zinc oxide, zirconium oxide, mica, iron oxide or a combination thereof. Even more preferred particles are particles comprising zinc oxide, zirconium oxide, titanium dioxide or a combination thereof as these materials have especially high refractive index. Most preferred is titanium dioxide.

For sake of good compatibility with the film-forming polymer and/or lipid, the optical particle is preferably hydrophobic. More preferably, the optical particle is preferably hydrophobically modified. Even more preferably the optical particle is modified by hydrophobic material selected from fatty acid, silicone oil, wax, and a mixture thereof. The fatty acid preferably comprises oleic acid, stearic acid, or a mixture thereof.

The size of optical particle is typical from 2 nm to 5 microns, more preferably from 5 nm to 1 micron, even more preferably from 10 nm to 500 nm. Particle size as used herein refers to the diameter of particles in an unaggregated state. Diameter means the largest measureable distance on a particle in the event a well-defined sphere is not generated. The diameter may be measured for example by scanning electron microscopy (SEM) by averaging the value of at least ten particles.

Preferably the composition comprises optical particles in an amount of from 0.001 to 10 wt%, more preferably 0.01 to 7 wt%, more preferably still 0.05 to 5 wt% and most preferably 0.1 to 2 wt%. The weight ratio of the film-forming polymer to the optical particle is preferably in the range of from 1:10 to 50:1, more preferably from 1:3 to 10:1, and most preferably from 1:1 to 5:1. The weight ratio of the lipid to the optical particle is preferably in the range of from 1:40 to 20:1, more preferably from 1:20 to 10:1, and most preferably from 1:10 to 5:1.

When the composition comprises silicone resin and optical particle, the weight ratio of the silicone resin to the optical particle is preferably in the range of from 1:10 to 50:1, more preferably from 1:3 to 10:1, and most preferably from 1:1 to 5:1.

When the composition comprises steroid and optical particle, the weight ratio of the steroid to the optical particle is preferably in the range of from 1:40 to 20:1, more preferably from 1:20 to 10:1, and most preferably from 1:10 to 5:1.

Compositions of the present invention will also include a cosmetically acceptable carrier. Water is the most preferred carrier. Amounts of water may, for example, range from 5 to 99%, preferably from 20 to 95%, more preferably from 40 to 90%, optimally between 60 and 85% by weight of the cosmetic composition.

Emollient materials may be included as carriers in compositions of this invention. These may be in the form of silicone oils, synthetic esters and/or hydrocarbons. Amounts of the emollients may range, for example, anywhere from 0.1 to 95%, more preferably between 1 and 50% by weight of the composition.

Silicone oils may be divided into the volatile and nonvolatile variety. The term “volatile” as used herein refers to those materials which have a measurable vapor pressure at ambient temperature (25 °C). Volatile silicone oils are preferably chosen from cyclic (cyclomethicone) or linear polydimethylsiloxanes containing from 3 to 9, preferably from 4 to 5, silicon atoms. In many liquid versions of compositions according to the present invention, the volatile silicone oils may form a relatively large component of the compositions as carriers. Amounts may range, for example, from 5% to 80%, more preferably from 20% to 70% by weight of the composition.

Nonvolatile silicone oils useful as an emollient material include polyalkyl siloxanes, polyalkylaryl siloxanes and polyether siloxane copolymers. The essentially nonvolatile polyalkyl siloxanes useful herein include, for example, polydimethyl siloxanes with viscosities of from about 5×10^{-6} to 0.1 m^2/s at 25 °C. Among the preferred nonvolatile emollients useful in the present compositions are the polydimethyl siloxanes having viscosities from about 1×10^{-5} to about 4×10^{-4} m^2/s at 25 °C.

Organopolysiloxane crosspolymers can be usefully employed. Representative of these materials are dimethicone/vinyl dimethicone crosspolymers and dimethicone crosspolymers available from a variety of suppliers including Dow Corning (9040, 9041, 9045, 9506 and 9509), General Electric (SFE 839), Shin Etsu (KSG-15, 16 and 18 [dimethicone/phenyl vinyl dimethicone crosspolymer]), and Grant Industries (Gransil brand of materials), and lauryl dimethicone/vinyl dimethicone crosspolymers supplied by Shin Etsu (e.g. KSG-31, KSG-32, KSG-41, KSG-42, KSG-43 and KSG-44). Amounts of the aforementioned organopolysiloxane crosspolymers (when present) will usually be from 0.1 to 20% by weight dissolved usually in a volatile silicone oil such as cyclomethicone.

When silicones are present in large amounts as carrier and water is also present, the systems may be oil continuous. These normally will require emulsification with a water-in-oil emulsifier such as a dimethicone copolyol (e.g. Abil EM-90 which is cetyl dimethicone copolyol).

Among the ester emollients are:

a) Alkenyl or alkyl esters of fatty acids having 10 to 20 carbon atoms. Examples thereof include isoarachidyl neopentanoate, isodecyl neopentanoate, isopropyl myristate, isononyl isonanoate, cetyl ricinoleate, oleyl myristate, oleyl stearate, and oleyl oleate.

b) Ether-esters such as fatty acid esters of ethoxylated fatty alcohols.

c) Polyhydric alcohol esters. Butylene glycol, ethylene glycol mono and di-fatty acid esters, diethylene glycol mono- and di-fatty acid esters, polyethylene glycol (200-6000) mono- and di-fatty acid esters, propylene glycol mono- and di-fatty acid esters, polypropylene glycol 2000 monooleate, polypropylene glycol 2000 monostearate, ethoxylated propylene glycol monostearate, glyceryl mono- and di-fatty acid esters, polyglycerol poly-fatty esters, ethoxylated glyceryl mono-stearate, 1,3-butylene glycol monostearate, 1,3-butylene glycol distearate, polyoxyethylene polyol fatty acid ester, sorbitan fatty acid esters, and polyoxyethylene sorbitan fatty acid esters are satisfactory polyhydric alcohol esters. Particularly useful are pentaerythritol, trimethylolpropane and neopentyl glycol esters of C_1-C_{30} alcohols. Exemplative is pentaerythrityl tetraethylhexanoate.

d) Wax esters such as beeswax, spermaceti wax and tribehenin wax.

e) Sterols esters, of which cholesterol fatty acid esters are examples thereof.

f) Sugar ester of fatty acids such as sucrose polybehenate and sucrose polycottonseedate.

Of particular use also are the C_{12-15} alkyl benzoate esters sold under the Finsolv brand.

Hydrocarbons which are suitable cosmetically acceptable carriers include petrolatum, mineral oil, C_{11}-C_{13} isoparaffins, polyalphaolefins, and especially isohexadecane, available commercially as Permethyl 101A from Presperse Inc.

Humectants of the polyhydric alcohol-type can be employed as cosmetically acceptable carriers. Typical polyhydric alcohols include polyalkylene glycols and more preferably alkylene polyols and their derivatives, including propylene glycol, dipropylene glycol, polypropylene glycol, polyethylene glycol and derivatives thereof, sorbitol, hydroxypropyl sorbitol, hexylene glycol, 1,3-butylene glycol, isoprene glycol, 1,2,6-hexanetriol, glycerol, ethoxylated glycerol, propoxylated glycerol and mixtures thereof. The amount of humectant may range, for example, anywhere from 0.5 to 50%, more preferably between 1 and 15% by weight of the composition. Most preferred is glycerol (also known as glycerin). Amounts of glycerin may range, for example, from 1% to 50%, more preferably from 10 to 35%, optimally from 15 to 30% by weight of the composition.

Besides optical particles, the compositions of this invention may include a variety of other functional ingredients. Sunscreen actives may be included in compositions of the present invention. These will be organic compounds having at least one chromophoric group absorbing within the ultraviolet ranging from 290 to 400 nm. Chromophoric organic sunscreen agents may be divided into the following categories (with specific examples) including: p-Aminobenzoic acid, its salts and its derivatives (ethyl, isobutyl, glyceryl esters; p-dimethylaminobenzoic acid); Anthranilates (o-aminobenzoates; methyl, menthyl, phenyl, benzyl, phenylethyl, linalyl, terpinyl, and cyclohexenyl esters); Salicylates (octyl, amyl, phenyl, benzyl, menthyl, glyceryl, and dipropyleneglycol esters); Cinnamic acid derivatives (menthyl and benzyl esters, alpha-phenyl cinnamonitrile; butyl cinnamoyl pyruvate); Dihydroxycinnamic acid derivatives (umbelliferone, methylumbelliferone, methylaceto-umbelliferone); Trihydroxycinnamic acid derivatives (esculetin, methylesculetin, daphnetin, and the glucosides, esculin and daphnin); Hydrocarbons (diphenylbutadiene, stilbene); Dibenzalacetone and benzalacetophenone; Naphtholsulfonates (sodium salts of 2-naphthol-3,6-disulfonic and of 2-naphthol-6,8-disulfonic acids); Dihydroxy-naphthoic acid and its salts; o- and p-Hydroxybiphenyldisulfonates; Coumarin derivatives (7-hydroxy, 7-methyl, 3-phenyl); Diazoles (2-acetyl-3-bromoindazole, phenyl benzoxazole, methyl naphthoxazole, various aryl benzothiazoles); Quinine salts (bisulfate, sulfate, chloride, oleate, and tannate); Quinoline derivatives (8-hydroxyquinoline salts, 2-phenylquinoline); Hydroxy- or methoxy-substituted benzophenones; Uric and vilouric acids; Tannic acid and its derivatives (e.g., hexaethylether); (Butyl carbityl) (6-propyl piperonyl) ether; Hydroquinone; Benzophenones (Oxybenzone, Sulisobenzone, Dioxybenzone, Benzoresorcinol, 2,2',4,4'-Tetrahydroxybenzophenone, 2,2'-Dihydroxy-4,4'-dimethoxybenzophenone, Octabenzone; 4-Isopropyldibenzoylmethane; Butylmethoxydibenzoylmethane; Etocrylene; and 4-isopropyl-dibenzoylmethane). Particularly useful are: 2-ethylhexyl p-methoxycinnamate, 4,4'-t-butyl methoxydibenzoylmethane, 2-hydroxy-4-methoxybenzophenone, octyldimethyl p-aminobenzoic acid, digalloyltrioleate, 2,2-dihydroxy-4-methoxybenzophenone, ethyl 4-[bis(hydroxypropyl)]aminobenzoate, 2-ethylhexyl-2-cyano-3,3-diphenylacrylate, 2-ethylhexylsalicylate, glyceryl p-aminobenzoate, 3,3,5-trimethylcyclohexylsalicylate, methylanthranilate, p-dimethylaminobenzoic acid or aminobenzoate, 2-ethylhexyl pdimethylaminobenzoate, 2-phenylbenzimidazole-5-sulfonic acid, 2-(p-dimethylaminophenyl)-5-sulfoniobenzoxazoic acid and mixtures thereof.

Particularly preferred are such materials as ethylhexyl p-methoxycinnamate, available as Parsol MCX®, Avobenzone, available as Parsol 1789®, Dermablock OS® (octylsalicylate) and Mexoryl SX® (with INCI name of Terephthalylidene Dicamphor Sulfonic Acid).

Amounts of the organic sunscreen agent may range, for example, from 0.1 to 15%, more preferably from 0.5% to 10%, optimally from 1% to 8% by weight of the composition.

A variety of thickening agents may be included in the compositions. Illustrative but not limiting are stearic acid, Acrylamide/Sodium Acryloyldimethyltaurate Copolymer (Aristoflex AVC), Hydroxyethyl Acrylate/Sodium Acryloyldimethyltaurate Copolymer, Aluminum Starch Octenyl Succinate, Polyacrylates (such as Carbomers including Carbopol® 980, Carbopol® 1342, Pemulen TR-2® and the Ultrez® thickeners), Polysaccharides (including xanthan gum, guar gum, pectin, carageenan and sclerotium gums), celluloses (including carboxymethyl cellulose, ethyl cellulose, hydroxyethyl cellulose and methyl hydroxymethyl cellulose), minerals (including talc, silica, alumina, mica and clays, the latter being represented by bentonites, hectorites and attapulgites), magnesium aluminum silicate and mixtures thereof. Amounts of the thickeners may range, for example, from 0.05 to 10%, more preferably from 0.3 to 2% by weight of the composition.

Preservatives can desirably be incorporated into the cosmetic compositions of this invention to protect against the growth of potentially harmful microorganisms. Suitable traditional preservatives for compositions of this invention are alkyl esters of para-hydroxybenzoic acid. Other preservatives which have more recently come into use include hydantoin derivatives, propionate salts, and a variety of quaternary ammonium compounds. Cosmetic chemists are familiar with appropriate preservatives and routinely choose them to satisfy the preservative challenge test and to provide product stability. Particularly preferred preservatives are phenoxyethanol, methyl paraben, propyl paraben, butyl paraben, isobutyl paraben, imidazolidinyl urea, sodium dehydroacetate and benzyl alcohol. The preservatives should be selected having regard for the use of the composition and possible incompatibilities between the preservatives and other ingredients in the composition. Preservatives are preferably employed in amounts ranging from 0.01% to 2% by weight of the composition.

Compositions of the present invention may also contain vitamins and flavonoids. Illustrative water-soluble vitamins are Niacinamide, Vitamin B_2, Vitamin B_6, Vitamin C, ascorbyl phosphate and Biotin. Among the useful water-insoluble vitamins are Vitamin A (retinol), Vitamin A Palmitate, ascorbyl tetraisopalmitate, Vitamin E (tocopherol), Vitamin E Acetate and DL-panthenol. A particularly suitable Vitamin B_6 derivative is Pyridoxine Palmitate. Among the preferred flavonoids are glucosyl hesperidin and rutin. Total amount of vitamins or flavonoids when present in compositions according to the present invention may range, for example, from 0.001 to 10%, more preferably from 0.01% to 5%, optimally from 0.1 to 3% by weight of the composition.

Desquamation agents are further optional components. Illustrative are the alpha-hydroxycarboxylic acids and beta-hydroxycarboxylic acids and salts of these acids. Among the former are salts of glycolic acid, lactic acid and malic acid. Salicylic acid is representative of the beta-hydroxycarboxylic acids. Amounts of these materials when present may range from 0.1 to 15% by weight of the composition.

A variety of herbal extracts may optionally be included in compositions of this invention. Illustrative are pomegranate, white birch (Betula Alba), green tea, chamomile, licorice, boswellia serrata, olive (Olea Europaea) leaf, arnica montana flower, lavandula angustifolia, and extract combinations thereof. The extracts may either be water soluble or water-insoluble carried in a solvent which respectively is hydrophilic or hydrophobic. Water and ethanol are the preferred extract solvents.

Miscellaneous other adjunct cosmetic ingredients that may be suitable for the present compositions include ceramides (e.g. Ceramide 3 and Ceramide 6), conjugated linoleic acids, colorants (e.g. iron oxides), metal (manganese, copper and/or zinc) gluconates, allantoin, palmitoyl pentapeptide-3, amino acids (e.g. alanine, arginine, glycine, lysine, proline, serine, threonine, glumatic acid and mixtures thereof), trimethylglycine, sodium PCA, chelator like disodium EDTA, magnesium aspartate, and combinations thereof. Amounts may, for example, vary from 0.000001 to 3% by weight of the composition.

A small amount of emulsifying surfactant may be present. Surfactants may be anionic, nonionic, cationic, amphoteric and mixtures thereof. Levels may range, for example, from 0.1 to 5%, more preferably from 0.1 to 2%, optimally from 0.1 to 1% by weight. Advantageously the amount of surfactant present should not be sufficient for lather formation. In these instances, less than 2% by weight, preferably less than 1%, and optimally less than 0.5% by weight surfactant is present. Emulsifiers like PEG-100 stearate may be used as well as emulsion stabilizers like cetearyl alcohol and ceteareth-20 may be used and typically in amounts that do not exceed 5 percent by weight of the composition.

Other optional additives suitable for use in the composition of this invention include cationic ammonium compounds to enhance moisturization. Such compounds include salts of hydroxypropyltri (C_1-C_3 alkyl) ammonium mono-substituted-saccharide, salts of hydroxypropyltri (C_1-C_3 alkyl) ammonium mono-substituted polyols, dihydroxypropyltri (C_1-C_3 alkyl) ammonium salts, dihydroxypropyldi (C_1-C_3 alkyl) mono(hydroxyethyl) ammonium salts, guar hydroxypropyl trimonium salts, 2,3-dihydroxypropyl tri(C_1-C_3 alkyl or hydroxalkyl) ammonium salts or mixtures thereof. In a most preferred embodiment and when desired, the cationic ammonium compound employed in this invention is the quaternary ammonium compound 1,2-dihydroxypropyltrimonium chloride. If used, such compounds typically make up from 0.01 to 30%, and more preferably from about 0.1 to about 15% by weight of the composition.

When cationic ammonium compounds are used, optional additives for use with the same are moisturizing agents such as substituted ureas like hydroxymethyl urea, hydroxyethyl urea, hydroxypropyl urea; bis(hydroxymethyl) urea; bis(hydroxyethyl) urea; bis(hydroxypropyl) urea; N,N'-dihydroxymethyl urea; N,N'-di-hydroxyethyl urea; N,N'-di-hydroxypropyl urea; N,N,N'-tri-hydroxyethyl urea; tetra(hydroxymethyl) urea; tetra(hydroxyethyl) urea; tetra(hydroxypropyl) urea; N-methyl-N'-hydroxyethyl urea; N-ethyl-N'-hydroxyethyl urea; N-hydroxypropyl-N'-hydroxyethyl urea and N,N'dimethyl-N-hydroxyethyl urea or mixtures thereof. Where the term hydroxypropyl appears, the meaning is generic for either 3-hydroxy-n-propyl, 2-hydroxy-n-propyl, 3-hydroxy-i-propyl or 2-hydroxy-i-propyl radicals. Most preferred is hydroxyethyl urea. The latter is available as a 50% aqueous liquid from AkzoNobel under the trademark Hydrovance. Such substituted ureas, while desirable in moisturizing formulations, are only selected for use when compatible with sunless tanning agent or agents (when used) in the compositions of this invention.

Amounts of substituted urea, when used, in the composition of this invention range from 0.01 to 20%, more preferably from 0.5 to 15%, and most preferably from 2 to 10% based on total weight of the composition and including all ranges subsumed therein.

When cationic ammonium compound and substituted urea are used, in a most especially preferred embodiment at least from 0.01 to 25%, more preferably from 0.2 to 20%, and most preferably from 1 to 15% humectant, like glycerine, is used, based on total weight of the composition and including all ranges subsumed therein.

When making the compositions of this invention, ingredients are typically mixed with moderate shear under atmospheric conditions. The compositions may be applied topically and preferably 1-4 milligrams of composition is applied per square centimeter of skin. Preferably, the compositions display a pH from 5 to 7. Packaging for the composition of this invention can be a jar or tube as well as any other format typically seen for cosmetic, cream, washing and lotion type products.

It is preferred that the composition is a skin care composition. The composition may be a leave-on composition or a wash-off composition, but preferably a leave-on composition.

The present invention also concerns a method for enhancing long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the method comprising administering to skin a cosmetic composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C. Preferably the composition is administered to the skin of an individual in need of improving skin opacity

The following examples are provided to facilitate an understanding of the invention. The examples are not intended to limit the scope of the claims.

EXAMPLES

Wash-off/abrasion resistance test I

1. Constructing a calibration curve

The base formulation (sample A in Table 1) was coated evenly onto Bio-skin plate (Color: 30#, ex. BEAULAX, Co. Ltd., Tokyo, Japan) with surface density of 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 5, and 6 mg/cm^2. After naturally drying at around 25°C for 8 hours, the lightness of these coated Bio-skin plates was measured using Digieye Imaging System (Verivide, UK). Then the lightness versus surface density was plotted and fitted by a 4 orders' polynomial model to obtain the curve. The R-Square was higher than 0.999 which demonstrated that the polynomial model was suitable to fit the functional relationship between the lightness and the surface density of the base formulation.

2. Wash-off/abrasion experiment

30 mg of samples was coated evenly onto Bio-skin plates with area of 10 cm^2. The coated Bio-skin plate was naturally dried at around 25°C for 8 hours. The lightness of the Bio-skin plate (L_1) was measured by Digieye Imaging System (Verivide, UK). The surface density value before wash-off/abrasion experiment (SD_1) was obtained according to the calibration curve. The coated bio-skin was soaked into de-ionized water for 30s. Then, a commercial face cleanser (Pond's gold radiance^{TM} Radiance Boosting Cleansing Mousse) with amount of 5 mg/cm^2 was applied onto the Bio-skin plate and the coated Bio-skin plate was washed by Martindale abrasion and pilling tester (Type: M235, SDL Altas, USA) with 33.72g of motion plate at the speed of 30 rpm for 1 min. Subsequently, the coated Bio-skin plate was soaked into water for another 1 min and washed by de-ionized water. After naturally drying at around 25°C for 2 hours, the lightness of the Bio-skin plate (L_2) was measured again by the Digieye Imaging System. The surface density after wash-off/abrasion experiment (SD_2) was obtained according to the calibration curve.

The deposition ratio after wash-off/abrasion experiment was calculated by:
Deposition ratio= $(SD_2/SD_1)\times100\%$.

Wash-off/abrasion resistance test *II*

The Wash-off/abrasion resistance test II is similar with test I except the following procedure. When constructing a calibration curve, the L (for lightness), a, and b (for the color-opponent dimensions) of these coated Bio-skin plates was measured and a ITA value was calculated by equation of $ITA = [\arctan(L-50/b)]\times180/\pi$. Then the ITA value versus surface density was plotted and fitted by a polynomial model to obtain the curve with R-Square higher than 0.999. When conducting wash-off/abrasion experiment, the corresponding ITA values were calculated and the surface density values (SD) before and after wash-off abrasion test were obtained according to the corresponding ITA values.

Measurement of Contact Angle and water soaking test

The contact angles of five film-forming polymers including Dow Corning^{TM} MQ-1640 Flake Resin, Dow Corning^{TM} MQ-1600 Solid Resin, Dow Corning^{TM} 670 Fluid from Dow Corning, Avalure^{TM} UR450 from Lubrizol, Lexorez^{TM} 100 from Inolex were conducted. Dow Corning^{TM} MQ-1600 Solid Resin and Dow Corning^{TM} 670 Fluid were dispersed into dimethicone with a polymer to solvent weight ratio of 1:9. The other three polymers were dispersed into ethanol with a polymer to solvent weight ratio of 1:9.

0.2 ml of film-forming polymer dispersions were dripped evenly onto an ordinary glass sides (about 2 cm×8cm). After the solvents evaporated, uniform films were formed. Drop shape analysis system 100 (DSA 100, Krüss) was used to measure contact angle using deionised water drops of around 5 μL applied to five different points of each film. The contact angle averaged over all 5 drops.

The contact angles of Dow Corning^{TM} MQ-1640 Flake Resin, Dow Corning^{TM} MQ-1600 Solid Resin, Dow Corning^{TM} 670, Avalure^{TM} UR450, and Lexorez^{TM} 100 were 107°, 116°, 114°, 66°, and 28° respectively.

Then, these glass slides coated with polymer films were immersed fully into water for 30 minutes. After that the glass slides were taken out from water and dried. The contact angles of these glass slides were measured again. It was surprisingly found that the contact angles of glass slides coated by Avalure^{TM} UR450, and Lexorez^{TM} 100 were decreased to less than 15°, indicating that the polymer film has been peeled off. In contrast, the contact angle of glass slides coated by Dow Corning^{TM} MQ-1640 Flake Resin, Dow Corning^{TM} MQ-1600 Solid Resin, and Dow Corning^{TM} 670 remained almost the same, manifesting that the polymer films were adhered onto the glass slides firmly.

Example 1

This example demonstrates uses of compositions containing cholesterol and different silicone resins to enhance the film wash-off resistance, abrasion resistance and therefore deposition of beneficial agent.

A series of cosmetic compositions were formulated as shown in Table 1 below. The formulations were prepared by the following process. The optical particles were completely dispersed in the oil phase with other ingredients and the silicone resin and/or lipid (when present) and mixed thoroughly. The resulting oil-based mixture was gradually added to the aqueous phase. The resulting mixture was emulsified under 9,000 rpm of shear stress for 10 minutes at 65 °C and gradually stirred and cooled to room temperature.

The deposition ratios of the samples were measured by following the *Wash-off/abrasion resistance performance test I*.

Table 1

Ingredient (wt%)	Sample							
	A	B	C	D	E	1	2	3
Water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.
Disodium EDTA	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PEG-100 Stearate (Myij 59 P)	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Glyceryl stearate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Caprylic / Capric Triglycerides	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Aristoflex AVC UL	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cyclomethicone/DC 245	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Preservative	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Titanium dioxide [a]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Silicone resin-1 [b]	---	3.00	---	---	---	3.00	---	---
Silicone resin-2 [c]	---	---	3.00	---	---	---	3.00	---
Silicone resin-3 [d]	---	---	---	3.00	---	---	---	3.00
Cholesterol [e]	---	---	---	---	1.00	1.00	1.00	1.00

a. MT700Z, Titanium Dioxide (and) Stearic Acid (and) Aluminium Hydroxide supplied by TAYCA
b. Dow Corning™ MQ-1640 Flake Resin, a blend of MQ and T Propyl resins, supplied by Dow Corning.
c. Dow Corning™ MQ-1600 Solid Resin, a 100% active MQ resin, supplied by Dow Corning.
d. Dow Corning™ 670 Fluid (45% active), Cyclopentasiloxane (and) Polypropylsilsesquioxane supplied by Dow Corning.
e. Cholesterol NF supplied by RITA corporation.

As can be seen in the Table 2, the compositions comprising different kinds of silicone resin alone (samples B, C and D) had a deposition ratio of over or around 35%. After inclusion of cholesterol into the samples, the deposition ratio of all the samples (Sample 1, 2 and 3) were not only increased, but also greater than the sum of deposition ratio of composition comprising silicone resin alone and composition comprising cholesterol alone (sample E). It was manifested that the addition of cholesterol into composition comprising silicone resin surprisingly improved the wash-off resistance, rub resistance and therefore enhance the deposition of optical particles.

The composition comprising MQ silicone resin, and cholesterol (Sample 2) had the highest deposition ratio increase among these three samples, showing that combination of MQ silicone resin and cholesterol can provide bigger increase for wash-off resistance, rub resistance and the deposition of optical particles.

Table 2

Sample	Silicone resin-1 (wt% active)	Silicone resin-2 (wt% active)	Silicone resin-3 (wt% active)	Cholesterol (wt% active)	Deposition Ratio (%)
B	3.00	0	0	0	59.32
C	0	3.00	0	0	36.60
D	0	0	1.35	0	46.15

E	0	0	0	1.00	3.41
1	3.00	0	0	1.00	76.29
2	0	3.00	0	1.00	90.51
3	0	0	1.35	1.00	68.39

Example 2

This example demonstrates uses of compositions containing different amount of silicone resin and cholesterol to enhance the film wash-off resistance, abrasion resistance and therefore deposition of beneficial agent.

The formulations in Table 3 were prepared and the deposition ratios were tested by the following similar procedures as described in Example 1.

Table 3

Ingredient (wt%)	Sample					
	4	5	6	7	8	F
Water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.
Disodium EDTA	0.10	0.10	0.10	0.10	0.10	0.10
PEG-100 Stearate (Myij 59 P)	1.85	1.85	1.85	1.85	1.85	1.85
Glyceryl stearate	1.00	1.00	1.00	1.00	1.00	1.00
Caprylic / Capric Triglycerides	3.00	3.00	3.00	3.00	3.00	3.00
Aristoflex AVC UL	1.00	1.00	1.00	1.00	1.00	1.00
Cyclomethicone/DC 245	8.00	8.00	8.00	8.00	8.00	8.00
Preservative	0.20	0.20	0.20	0.20	0.20	0.20
Titanium dioxide*	1.00	1.00	1.00	1.00	1.00	1.00
Silicone resin-2*	3.00	3.00	3.00	2.00	1.00	0.50
Cholesterol *	0.05	0.10	0.30	1.00	1.00	1.00

* Same as in Table 1

Table 4 shows the deposition ratios of the compositions with silicone resin and cholesterol with different concentration and weight ratio. The compositions of the present invention (sample 4, 5, 6, 7, and 8) had improved deposition with the addition of cholesterol, showing that the composition comprising silicone resin, and cholesterol with different ratio and/or concentration can improve wash-off resistance, rub resistance and the deposition of optical particles. The composition comprising silicone resin and cholesterol with a weight ratio of silicone resin to cholesterol of 1:2 (sample F) did not shows improved deposition.

Among the compositions of the present invention, both the compositions having silicone resin and cholesterol in a weight ratio of 30:1, 10:1, 3:1 and 2:1 (sample 5, 6, 2 and 7) had a deposition ratio greater that 70%, demonstrating that the performances of wash-off resistance, rub resistance and the deposition of optical particles of compositions having silicone resin and cholesterol in a weight ratio of 30:1, 10:1, 3:1 and 2:1 were better than others.

Table 4

Sample	Silicone resin (wt% active)	Cholesterol (wt% active)	Weight ratio of silicone resin to cholesterol	Deposition Ratio (%)
4	3.00	0.05	60:1	39.34
5	3.00	0.10	30:1	75.08
6	3.00	0.30	10:1	85.14
7	2.00	1.00	2:1	74.73
8	1.00	1.00	1:1	50.68
F	0.50	1.00	1:2	15.94

<u>Example 3</u>

This example demonstrates use of compositions containing fatty acid and different film-forming polymer to improve the wash-off resistance.

The formulations in Table 5 were prepared following similar procedures as described in Example 1 and the deposition ratios were tested by following *Wash-off/abrasion resistance test II*.

Table 5

Ingredient (wt%)	Samples						
	G	H	9	10	11	12	13
Water	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.
Disodium EDTA	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PEG-100 Stearate (Myij 59 P)	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Glyceryl stearate	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Caprylic / Capric Triglycerides	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Aristoflex AVC UL	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cyclomethicone/DC 245	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Preservative	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Titanium dioxide [a]	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Silicone resin-1 [b]	3.00	---	3.00	3.00	---	3.00	3.00
Silicone resin-2 [c]	---	3.00	---	---	3.00	---	---
Stearic acid[d]	---	---	0.50	1.00	1.00	2.00	3.00

a. MT700Z, Titanium Dioxide (and) Stearic Acid (and) Aluminium Hydroxide supplied by TAYCA
b. Dow Corning™ MQ-1640 Flake Resin, a blend of MQ and T Propyl resins, supplied by Dow Corning.
c. Dow Corning™ MQ-1600 Solid Resin, a 100% active MQ resin, supplied by Dow Corning.
d. Supplied by Emery Oleochemicals (M) Sdn. Bhd.

As can be seen in Table 6, with the addition of fatty acid into the composition with different silicone resins, the deposition ratios after wash-off test for all compositions (samples 9 to 13) were increased. It was found that the inclusion of fatty acid of the present invention unexpectedly improved the wash-off resistance, rub resistance, and the long-lasting deposition of optical particles. It was also surprisingly found that the fatty acid can improve the deposition ratio of composition containing silicone-1 more than that of the composition containing silicone-2.

Table 6

Sample	Silicone resin-1 (wt%)	Silicone resin-2 (wt%)	Stearic acid (wt%)	Deposition Ratio (%)
G	3.00	0	0	61.5±3.1
H	0	3.00	0	30.1±2.6
9	3.00	0	0.50	69.3±1.6
10	3.00	0	1.00	73.8±2.1
11	3.00	0	2.00	85.6±6.3
12	3.00	0	3.00	72.5±2.3
13	0	3.00	1.00	35.5±2.0

Example 4

This example demonstrates uses of compositions containing film-forming polymer and different fatty acids to improve the wash-off resistance.

The formulations in Table 7 were prepared and the deposition ratios were tested by the following similar procedures as described in Example 3.

Table 7

Ingredient (wt%)	Samples				
	14	15	16	17	18
Water	Bal.	Bal.	Bal.	Bal.	Bal.
Disodium EDTA	0.10	0.10	0.10	0.10	0.10
PEG-100 Stearate (Myij 59 P)	1.85	1.85	1.85	1.85	1.85
Glyceryl stearate	1.00	1.00	1.00	1.00	1.00
Caprylic / Capric Triglycerides	3.00	3.00	3.00	3.00	3.00
Aristoflex AVC UL	1.00	1.00	1.00	1.00	1.00
Cyclomethicone/DC 245	8.00	8.00	8.00	8.00	8.00
Preservative	0.20	0.20	0.20	0.20	0.20
Titanium dioxide [a]	1.00	1.00	1.00	1.00	1.00
Silicone resin-1 [b]	3.00	3.00	3.00	3.00	3.00
Lauric acid[c]	1.00	---	---	---	---
Myristic acid[c]	---	1.00	---	---	---
Palmitic acid[c]	---	---	1.00	---	---
Oleic acid[c]	---	---	---	1.00	---
12-hydroxy stearic acid[d]	---	---	---	---	1.00
Deposition Ratio (%)	71.6±2.5	72.1±3.3	72.6±2.9	71.6±1.9	68.3±3.0

a. MT700Z, Titanium Dioxide (and) Stearic Acid (and) Aluminium Hydroxide supplied by TAYCA
b. Dow Corning™ MQ-1640 Flake Resin, a blend of MQ and T Propyl resins, supplied by Dow Corning.
c. Supplied by Emery Oleochemicals (M) Sdn. Bhd.
d. Supplied by Vertellus Performance Materials Inc.

As shown in the last row of Table 7, the deposition ratios of composition containing both film-forming polymer and different fatty acids had been increased by comparing with that of composition containing film-forming polymer merely. It was manifested that the incorporation of different fatty acids improved wash-off resistance and therefore long-lasting whitening. It was also surprisingly found that the fatty acid without substitution improved wash-off resistance more than the fatty acid with a degree of substitution.

<u>Example 5</u>

This example demonstrates uses of compositions containing different silicone resin and wax to improve the film wash-off resistance.

The formulations in Table 8 were prepared and the deposition ratios were tested by the following similar procedures as described in Example 3.

Table 8

Ingredient (wt%)	Samples		
	19	20	21
Water	Bal.	Bal.	Bal.
Disodium EDTA	0.10	0.10	0.10
PEG-100 Stearate (Myij 59 P)	1.85	1.85	1.85
Glyceryl stearate	1.00	1.00	1.00
Caprylic / Capric Triglycerides	3.00	3.00	3.00
Aristoflex AVC UL	1.00	1.00	1.00
Cyclomethicone/DC 245	8.00	8.00	8.00
Preservative	0.20	0.20	0.20
Titanium dioxide [a]	1.00	1.00	1.00
Silicone resin-1 [b]	3.00	---	3.00
Silicone resin-2 [c]	---	3.00	---
Beeswax[d]	1.00	1.00	---
Petroleum jelly[e]	---	---	1.00
Deposition Ratio	87.7±3.0	50.9±0.5	76.6±2.5

a. MT700Z, Titanium Dioxide (and) Stearic Acid (and) Aluminium Hydroxide supplied by TAYCA
b. Dow Corning™ MQ-1640 Flake Resin, a blend of MQ and T Propyl resins, supplied by Dow Corning.
c. Dow Corning™ MQ-1600 Solid Resin, a 100% active MQ resin, supplied by Dow Corning.
d. Wax#100, White Beeswax, supplied by Koster Keunen Inc.
e. MERKUR™ 620, supplied by Sasol.

As can be seen in the last row of Table 8, after inclusion of wax into the samples, the deposition ratios (samples 19 to 21) were increased. It was also found that by incorporating wax the deposition ratio of composition containing silicone-1 was increased more than composition containing silicone-2. It was manifested that the addition of wax into composition comprising silicone resin surprisingly improved the wash-off resistance, rub resistance and therefore enhance the deposition of optical particles.

Claims

1. Use of a cosmetic composition for enhancing opacity, long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C.

2. A method for enhancing long-lasting opacity, cumulative deposition of beneficial agent, wash-off resistance, abrasion resistance, or combination thereof, the method comprising the step of topically applying to skin a cosmetic composition, the composition comprising film-forming polymer having a contact angle of at least 85° and lipid having a melting point of at least 5°C.

3. The use according to claim 1 or method according to claim 2 wherein the film-forming polymer comprises a silicone resin, preferably is a silicone resin.

4. The use or method according to any one of the proceeding claims wherein the amount of film-forming polymer is from 0.01 to 20% by weight of the composition, preferably from 0.5 to 7%.

5. The use or method according to any one of the preceding claims wherein the weight ratio of film-forming polymer to the lipid is from 30:1 to 1:3.

6. The use or method according to any one of the preceding claims wherein the amount of lipid is from 0.01 to 20% by weight of the composition, preferably from 0.2 to 5% by weight of the composition.

7. The use or method according to any one of the preceding claims wherein the lipid comprises fatty acid, soap, fatty alcohol, fatty ester, wax, steroid, ceramide, or a mixture thereof, preferably fatty acid, soap, wax, steroid, or a mixture thereof.

8. The use or method according to claim 7 wherein the lipid comprises fatty acid, preferably the fatty acid comprises stearic, lauric, palmitic, isostearic, myristic acid, or a mixture thereof.

9. The use or method according to claim 8 wherein the amount of fatty acid is from 0.1 to 10% by weight of the composition.

10. The use or method according to any one of claims 7 to 9 wherein the lipid comprises a wax, preferably, the wax comprises a wax ester.

11. The use or method according to claim 10 wherein amount of wax is from 0.1 to 10% by weight of the composition.

12. The use or method according to any one of claim claims 7 to 11 wherein the lipid comprises a steroid, preferably cholesterol.

13. The use or method according to claim 12 wherein the amount of steroid is from 0.1 to 10% by weight of the composition.

14. The use or method according to any one of the preceding claims wherein the composition comprises optical particle, preferably the optical particle is present in amount of 0.05 to 5% by weight of the composition.

15. The use or method according to claim 14 wherein the optical particle comprises titanium dioxide, zinc oxide, zirconium oxide, mica, iron oxide or a combination thereof, preferably comprises titanium dioxide, zinc oxide, zirconium oxide or a combination thereof, and more preferably comprises titanium dioxide.

16. The use or method according to claim 14 or 15 wherein the weight ratio of the lipid to the optical particle is from 5:1 to 1:5.

17. The use or method according to any one of the preceding claims wherein the composition comprises 40 to 90% of water by weight of the composition.

18. The use or method according to any one of the preceding claims wherein the composition is a skin care composition.

19. The use or method according to any one of the preceding claims wherein the lipid has a melting point of at least 35°C, preferably from 40 to 200°C.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/089848

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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: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)

DATABASE: DWPI, CNABS, CPRSABS, CNTXT, CNKI, CA, EMBASE

KEY WORDS: UNIL, contact angle, MQ-1600, MQ-1640, trimethylsiloxy silicate, polypropyl silsesquioxane, stearic, lauric, palmitic, isostearic, myristic, cholesterol, steroid, chitosan, wax, beewax, beeswax, petroleum jelly

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP2004203788A (KOSE CORP), 22 Jul. 2004(22.07.2004), see example 12	1-19
X	WO2010129445A2 (ELC MANAGEMENT LLC), 11 Nov.2010(11.11.2010), see example II, formula 3 and page 15 lines 1-3	1-19
X	KR20080086620A (LG HOUSEHOLD & HEALTHCARE LTD), 26 Sep.2008(26.09.2008), see paragraphs 44-50	1-19
X	EP2263639A2 (KAO CORP), 22 Dec. 2010(22.12.2010), see example 6	1-19

☐ 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

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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 20 Feb.2014(20.02.2014)	Date of mailing of the international search report **27 Mar. 2014 (27.03.2014)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer GUO, Yixin Telephone No. (86-10)62412188

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2013/089848

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP2004203788A	22.07.2004	None	
WO2010129445A2	11.11.2010	JP2012526119A	25.10.2012
		EP2427182A2	14.03.2012
		US2012121673A1	17.05.2012
		AU2010246144A1	08.12.2011
		WO2010129445A3	03.02.2011
		US2011110988A1	12.05.2011
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KR20080086620A	26.09.2008	KR1342071B1	16.12.2013
EP2263639A2	22.12.2010	JP2011021007A	03.02.2011
		CN101926736A	29.12.2010
		CN101926736B	06.11.2013

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/089848

Continuation of :

A. CLASSIFICATION OF SUBJECT MATTER

A61K8/19(2006.01)i

A61K8/34(2006.01)i

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A61K8/89(2006.01)i

A61K8/92(2006.01)i

A61Q1/02(2006.01)i