(54) Title: SWELLABLE COSMETIC SYSTEMS

![Fig.1](image)

(57) Abstract: The invention relates to a cosmetic system comprising a basecoat composition comprising at least one acrylic thickener and a topcoat composition comprising at least one aqueous polyurethane dispersion.
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TITLE OF THE INVENTION

SWELLABLE COSMETIC SYSTEMS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of priority under 35 U.S.C. § 119(e) from U.S. Provisional Application Serial No. 61/424,200, filed December 17, 2010, the entire contents of which is hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to cosmetic systems comprising a basecoat comprising at least one acrylic thickener and a topcoat comprising at least one aqueous polyurethane dispersion. Among other improved or beneficial properties, when the topcoat is applied to the basecoat, the basecoat swells, thereby providing good volumizing properties.

DISCUSSION OF THE BACKGROUND

[0003] Many cosmetic compositions, including pigmented cosmetics such as foundations, concealers, lipsticks, and mascaras, and other cosmetic and sunscreen compositions, have been formulated in an attempt to possess good feel and texture upon application. Unfortunately, many of these compositions can be difficult to apply and do not possess a soft texture or smooth feel upon application. Moreover, such compositions oftentimes have a tendency to feel tacky, yielding poor application and spreadability characteristics.
Silicone elastomers have been added to cosmetic compositions to improve the feel of the compositions. However, the use of silicone elastomers can be problematic, given their expense and that they can be difficult to formulate owing to their chemical make up -- for example, compositions including silicone elastomers can be unstable, particularly if uncomplimentary compounds are added to an elastomer-containing composition.

Thus, there remains a need for improved cosmetic compositions having improved cosmetic properties, particularly good feel and texture characteristics upon application, without relying solely (if at all) upon silicone elastomers, and which can be easily removed.

Accordingly, one aspect of the present invention is a care and/or makeup and/or treatment composition for keratinous material which has good cosmetic properties such as, for example, good feel and/or texture properties upon application, and/or good volumizing properties.

SUMMARY OF THE INVENTION

The present invention relates to cosmetic systems comprising a basecoat comprising at least one acrylic thickener and at least one fatty substance, and a topcoat comprising at least one aqueous polyurethane dispersion, at least one polar modified polymer, at least one alkoxyalted fatty alcohol, and at least one polyamine compound. Preferably, the basecoat composition is anhydrous and the topcoat composition is in the form of a water-in-oil emulsion gel.
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 the basecoat composition of the present invention to the keratinous material and then applying the topcoat composition of the present invention to the basecoat composition in an amount sufficient to treat, care for and/or make up the keratinous material. Preferably, these methods comprise exposing the applied basecoat composition to water in the topcoat composition in an amount sufficient to swell the acrylic thickener in the basecoat composition.

The present invention also relates to methods of enhancing the appearance of keratinous material (for example, skin, eyes, eyelashes, or lips) by applying the basecoat composition of the present invention to the keratinous material and then applying the topcoat composition of the present invention to the basecoat composition in an amount sufficient to enhance the appearance of the keratinous material. Preferably, these methods comprise exposing the applied basecoat composition to water in the topcoat composition in an amount sufficient to swell the acrylic thickener in the basecoat composition.

The present invention also relates to methods of volumizing eyelashes comprising applying the basecoat composition of the present invention to eyelashes and then applying the topcoat composition of the present invention to the basecoat composition to expose the applied basecoat composition (mascara) to water in an amount sufficient to swell the acrylic thickener in an amount sufficient to volumize the eyelashes.
The present invention further relates to kits containing a basecoat and topcoat composition of the present invention.

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.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a visual depiction of the results of applying compositions of the present invention and a comparative composition in Example 3.

Fig. 2 is a graphical depiction of the results of applying compositions of the present invention and a comparative composition in Example 3.

Fig. 3 is a graphical depiction of the results of applying compositions of the present invention and two commercial products in Example 4.

DETAILED DESCRIPTION OF THE INVENTION

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

Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients and/or reaction conditions are to be understood as being modified in all instances by the term "about," meaning within 10% to 15% of the indicated number.
"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.

"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.

[0020] "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.

[0021] "Substituted" as used herein, means comprising at least one substituent. Non-limiting examples of substituents include atoms, such as oxygen atoms and nitrogen atoms, as well as functional groups, such as hydroxyl groups, ether groups, alkoxy groups, acyloxyalky groups, oxyalkylene groups, polyoxyalkylene groups, carboxylic acid groups, amine groups, acylamino groups, amide groups, halogen containing groups, ester groups, thiol groups, sulphonate groups, thiosulphate groups, siloxane groups, and polysiloxane groups. The substituent(s) may be further substituted.

[0022] "Volatile", as used herein, means having a flash point of less than about 100°C.
"Non-volatile", as used herein, means having a flash point of greater than about 100°C.

"Anhydrous" means the compositions contain less than 1% water. Preferably, the compositions of the present invention comprising the at least one acrylic thickener contain no water.

The compositions discusses below may be in any form, either liquid or non-liquid (semi-solid, soft solid, solid, etc.). For example, they may be a paste, a solid, a gel, or a cream. They 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. The compositions of the invention may, for example, comprise an external or continuous fatty phase. The compositions can also be a molded composition or cast as a stick or a dish.

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.

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 ± 50gf.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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.

[0032] 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.

[0033] BASECOAT COMPOSTION

[0034] According to the present invention, basecoat compositions comprising at least one acrylic thickener and at least one fatty substance are provided. According to preferred embodiments, the basecoat
composition contains little or no water. Preferably, the basecoat composition is anhydrous.

[0035] ACRYLIC THICKENER

[0036] According to the present invention, compositions comprising at least one acrylic thickener are provided. "Acrylic thickener" as used herein refers to polymers based upon one or more (meth)acrylic acid (and corresponding (meth)acrylate) monomers or similar monomers.

[0037] According to preferred embodiments, the acrylic thickener is an anionic acrylic polymer comprising at least one monomer performing a weak acid function such as, for example, acrylic acid, methacrylic acid, itaconic acid, crotonic acid, maleic acid and/or fumaric acid.

[0038] According to preferred embodiments, the acrylic thickener is an anionic acrylic polymer further comprising at least one monomer performing a strong acid function such as, for example, monomers having a function of the sulfonic acid type or phosphonic acid type, such as 2-acrylamido-2-methylpropane sulfonic acid (AMPS).

[0039] According to preferred embodiments, the anionic acrylic polymer may be crosslinked (or branched). Suitable examples of acceptable crosslinking agents include, but are not limited to, methylene bisacrylamide (MBA), ethylene glycol diacrylate, polyethylene glycol dimethacrylate, diacrylamide, cyanomethacrylate, vinylxyethacrylate or methacrylate, formaldehyde, glyoxal, and compositions of the glycidylether type such as ethyleneglycol diglycidylether, or epoxydes.

[0040] Particularly preferred acrylic thickeners are disclosed in U.S. patent application publication nos. 2004/0028637 and 2008/0196174,
the entire contents of both of which are incorporated herein by reference. Particularly preferred acrylic thickeners are sodium acrylate/sodium acryloyldimethyl taurate. A particularly preferred acrylic thickener is that sold under the INCI name Sodium Acrylate/Sodium Acryloyldimethyl Taurate Copolymer & Hydrogenated Polydecene & Sorbitan Laurate & Trideceth-6 which is marketed by Arch Personal Care Products, South Plainfield, NJ, USA under the tradename ViscUp®EZ. Preferably, the acrylic thickener(s) represent from about 0.1% to about 20% of the total weight of the composition, more preferably from about 1% to about 10% of the total weight of the composition, and most preferably from about 2.5% to about 7.5%, including all ranges and subranges therebetween.

[0041] OIL PHASE

[0042] According to the present invention, compositions comprising at least one fatty substance are provided. Suitable fatty substances include oil(s) and/or wax(es). "Oil" means any non-aqueous medium which is liquid at ambient temperature (25°C) and atmospheric pressure (760 mm Hg). A "wax" for the purposes of the present disclosure is a lipophilic fatty compound that is solid at ambient temperature (25°C) and changes from the solid to the liquid state reversibly, having a melting temperature of more than 30°C and, for example, more than 45°C, which can be as high as 150°C, a hardness of more than 0.5 MPa at ambient temperature, and an anisotropic crystalline organization in the solid state. By taking the wax to its melting temperature, it is possible to use wax(es) by
themselves as carriers and/or it is possible to make wax(es) miscible with 
the oils to form a microscopically homogeneous mixture.

[0043] Suitable oils include volatile and/or non-volatile oils. 
Such oils can be any acceptable oil including but not limited to silicone oils 
and/or hydrocarbon oils.

[0044] According to certain embodiments, the composition of the present invention preferably comprise 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.

[0045] Non-limiting examples of volatile silicone oils are listed in 
Table 1 below.
Further, a volatile linear silicone oil may be employed in 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.

According to other embodiments, the composition of the present invention preferably comprises 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 Cs to C16 alkanes such as C8 to C16 isoalkanes (also known as isoparaffins), isododecane, isodecane, and
for example, the oils sold under the trade names of Isopar or Permethyl.

Preferably, the volatile non-silicone oils have a flash point of at least 40°C.

[0049] Non-limiting examples of volatile non-silicone volatile oils are given in Table 2 below.

Table 2

<table>
<thead>
<tr>
<th>Compound</th>
<th>Flash Point (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isododecane</td>
<td>43</td>
</tr>
<tr>
<td>Propylene glycol n-butyl ether</td>
<td>60</td>
</tr>
<tr>
<td>Ethyl 3-ethoxypropionate</td>
<td>58</td>
</tr>
<tr>
<td>Propylene glycol methylether acetate</td>
<td>46</td>
</tr>
<tr>
<td>Isopar L (isoparaffin C_{11-13})</td>
<td>62</td>
</tr>
<tr>
<td>Isopar H (isoparaffin C_{11-C_{12}})</td>
<td>56</td>
</tr>
</tbody>
</table>

[0050] The volatility of the solvents/oils can be determined using the evaporation speed as set forth in U.S. patent no. 6,338,839, the contents of which are incorporated by reference herein.

[0051] According to other embodiments of the present invention, the composition comprises at least one non-volatile oil. Examples of non-volatile oils that may be used in the present invention include, but are not limited to, polar oils such as:

[0052] - hydrocarbon-based plant oils with a high triglyceride content consisting of fatty acid esters of glycerol, the fatty acids of which may have varied chain lengths, these chains possibly being linear or branched, and saturated or unsaturated; these oils are especially wheat germ oil, corn oil, sunflower oil, karite butter, castor oil, sweet almond oil, macadamia oil, apricot oil, soybean oil, rapeseed oil, cottonseed oil, alfalfa oil, poppy oil, pumpkin oil, sesame seed oil, marrow oil, avocado oil, hazelnut oil, grape seed oil, blackcurrant seed oil, evening primrose oil, millet oil, barley oil, quinoa oil, olive oil, rye oil, safflower oil, candlenut oil,
passion flower oil or musk rose oil; or caprylic/capric acid triglycerides, for instance those sold by the company Stearineries Dubois or those sold under the names Miglyol 810, 812 and 818 by the company Dynamit Nobel;

- synthetic oils or esters of formula $R_5\text{COOR}_6$ in which $R_5$ represents a linear or branched higher fatty acid residue containing from 1 to 40 carbon atoms, including from 7 to 19 carbon atoms, and $R_6$ represents a branched hydrocarbon-based chain containing from 1 to 40 carbon atoms, including from 3 to 20 carbon atoms, with $R_6 + R_7 \geq 10$, such as, for example, Purcellin oil (cetostearyl octanoate), isononyl isononanoate, C12 to Cl5 alkyl benzoate, isopropyl myristate, 2-ethylhexyl palmitate, and octanoates, decanoates or ricinoleates of alcohols or of polyalcohols; hydroxylated esters, for instance isostearyl lactate or diisostearyl malate; and pentaerythritol esters;

- synthetic ethers containing from 10 to 40 carbon atoms;

- Cs to C26 fatty alcohols, for instance oleyl alcohol, cetyl alcohol, stearyl alcohol, and cetearly alcohol; and

- mixtures thereof.

Further, examples of non-volatile oils that may be used in the present invention include, but are not limited to, non-polar oils such as branched and unbranched hydrocarbons and hydrocarbon waxes including polyolefins, in particular Vaseline (petrolatum), paraffin oil, squalane, squalene, hydrogenated polyisobutene, hydrogenated polydecene, polybutene, mineral oil, pentahydrosqualene, and mixtures thereof.
According to preferred embodiments of the present invention, the at least oil is a high viscosity oil which is a silicone oil and/or a hydrocarbon oil.

Suitable examples of such silicone oils include, but are not limited to, non-volatile silicone fluids such as, for example, polyalkyl (aryl) siloxanes. Suitable polyalkyl siloxanes include, but are not limited to, polydimethyl siloxanes, which have the CTFA designation dimethicone, polydiethyl siloxane, phenyl trimethicone, trimethyl pentaphenyl trisiloxane, phenyltrimethicone, phenyltrimethylsiloxydiphenylsiloxane, diphenyl(dimethicone), and diphenylmethyl(dimethicone) and those siloxanes disclosed in U.S. patent application publication no. 2004/0126350, the entire disclosure of which is hereby incorporated by reference. Specific examples of suitable high viscosity silicone oils include, but are not limited to, 15M30 from PCR (500 cSt) or Belsil PDM 1000 (1000 cSt) from Wacker and Dow Corning 200 (350 cSt) (the values in parenthesis represent viscosities at 25°C).

Suitable examples of such hydrocarbon oils include, but are not limited to, fluids having a molecular mass of more than 500 g/mol, for example more than 600 g/mol, and for example more than 650 g/mol. By "hydrocarbon" compound, it is meant a compound comprising principally atoms of carbon and hydrogen and optionally one or more functional groups chosen from hydroxyl, ester, ether and carboxyl functions. These compounds are, according to one aspect, devoid of -Si-O- groups. Suitable examples of hydrocarbon fluids include, but are not limited to polybutylenes, such as Indopol H-100 (of molar mass or MM=965 g/mol),
Indopol H-300 (MM=1 340 g/mol), and Indopol H-1500 (MM=2 160 g/mol), which are sold or manufactured by Amoco; hydrogenated polyisobutylene,

such as Panalane H-300 E, sold or manufactured by Amoco (M=1 340 g/mol), Viseal 20000 sold or manufactured by Synteal (MM=6 000 g/mol), and Rewopal PIB 1000, sold or manufactured by Witco (MM=1 000 g/mol); polydecenes and hydrogenated polydecenes, such as Puresyn 10 (MM=723 g/mol) and Puresyn 150 (MM=9 200 g/mol) sold or manufactured by Mobil Chemicals; esters such as linear fatty acid esters having a total carbon number ranging from 30 to 70, such as pentaerythrityl tetrapelargonate (MM=697.05 g/mol); hydroxy esters, such as diisostearyl malate (MM=639 g/mol); aromatic esters such as tridecyl trimellitate (MM=757.19 g/mol); esters of C24-C28 branched fatty acids or fatty alcohols, such as those described in EP-A-0 955 039, for example triisocetyl citrate (MM=856 g/mol), pentaerythrityl tetraisononanoate (MM=697.05 g/mol), glyceryl triisostearate (MM=891.51 g/mol), glyceryl 2-tridecyltetradecanoate (MM=1 143.98 g/mol), pentaerythrityl tetraisostearate (MM=1 202.02 g/mol), poly-2-glyceryl tetraisostearate (MM=1 232.04 g/mol) and pentaerythrityl 2-tetradecyltetradecanoate (MM=1 538.66 g/mol); and mixtures thereof.

Suitable ester oils can also be described according to formula RiCOOR2 in which R1 represents a linear or branched higher fatty acid residue containing from 1 to 40 carbon atoms, including from 7 to 19 carbon atoms, and R2 represents a branched hydrocarbon-based chain containing from 1 to 40 carbon atoms, including from 3 to 20 carbon atoms, with R1 + R2 ≥ 10, such as, for example, Purcellin oil (cetostearyl octanoate), isononyl isononanoate, C12 to C15 alkyl benzoate, isopropyl myristate, 2-ethylhexyl palmitate, and
octanoates, decanoates or ricinoleates of alcohols or of polyalcohols; hydroxylated esters, for instance isostearyl lactate or diisostearyl malate; and pentaerythritol esters. A particularly preferred ester is diisostearyl malate.

[0061] According to preferred embodiments, the at least one oil is present in the compositions of the present invention in an amount ranging from about 0.1 to about 30% by weight, more preferably from about 0.5% to about 15% by weight, and most preferably from about 1% to about 5% by weight, based on the total weight of the composition, including all ranges and subranges within these ranges.

[0062] According to preferred embodiments of the present invention, the compositions of the present invention comprise at least one wax. Suitable examples of waxes that can be used in accordance with the present disclosure include those generally used in the cosmetics field: they include those of natural origin, such as beeswax, carnauba wax, candelilla wax, ouricoury wax, Japan wax, cork fibre wax or sugar cane wax, rice wax, montan wax, paraffin wax, lignite wax or microcrystalline wax, ceresin or ozokerite, and hydrogenated oils such as hydrogenated castor oil or jojoba oil; synthetic waxes such as the polyethylene waxes obtained from the polymerization or copolymerization of ethylene, and Fischer-Tropsch waxes, or else esters of fatty acids, such as octacosanyl stearate, glycerides which are concrete at 30°C, for example at 45°C, silicone waxes, such as alkyl- or alkoxydimethicones having an alkyl or alkoxy chain ranging from 10 to 45 carbon atoms, poly(di)methylsiloxane esters which are solid at 30°C. and whose ester chain comprising at least 10 carbon atoms, or else di(1,1,1-
trimethylolpropane) tetrastearate, which is sold or manufactured by Heterene under the name HEST 2T-4S, and mixtures thereof.

[0063] If present, the wax or waxes may be present in an amount ranging from 0.1 to 50% by weight relative to the total weight of the composition, for example from 1 to 30%, and for example from 3 to 25%, including all ranges and subranges therebetween.

[0064] According to preferred embodiments, the acrylic thickener and the fatty substance(s) are present in the compositions of the present invention in a weight ratio of 1:2 to 1:20, preferably 1:3 to 1:15, and preferably 1:4 to 1:12, including all ranges and subranges therebetween.

[0065] TOPCOAT COMPOSITION

[0066] According to the present invention, topcoat compositions comprising at least one oil-soluble polar modified polymer, at least one aqueous polyurethane dispersion, at least one alkoxylated fatty alcohol and at least one polyamine compound are provided.

[0067] According to preferred embodiments, the topcoat composition is in the form of an emulsion. Preferably, the composition is in the form of a water-in-oil emulsion. Preferably, the composition is in the form of a water-in-oil emulsion gel.

[0068] OIL-SOLUBLE POLAR MODIFIED POLYMER

[0069] According to the present invention, compositions comprising at least one oil-soluble polar modified polymer are provided. "Polar modified polymer" as used herein refers to a hydrophobic homopolymer or copolymer which has been modified with hydrophilic unit(s).
"Oil-soluble" as used herein means that the polar modified polymer is soluble in oil.

[0070] Suitable monomers for the hydrophobic homopolymers and/or copolymers include, but are not limited to, cyclic, linear or branched, substituted or unsubstituted, C2-C20 compounds such as, for example, styrene, ethylene, propylene, isopropylene, butylene, isobutylene, pentene, isopentene, isoprene, hexene, isohexene, decene, isodecene, and octadecene, including all ranges and subranges therebetween. Preferably, the monomers are C2-C8 compounds, more preferably C2-C6 compounds, and most preferably C2-C4 compounds such as ethylene, propylene and butylene.

[0071] Suitable hydrophilic unit(s) include, but are not limited to, maleic anhydride, acrylates, alkyl acrylates such as, for example, methyl acrylate, ethyl acrylate, propyl acrylate, and butyl acrylate, and polyvinylpyrrolidone (PVP).

[0072] According to the present invention, the polar modified polymer is oil-soluble: that is, the polymer does not contain a sufficient amount of hydrophilic unit(s) to render the entire polymer water-soluble or oil-insoluble. According to preferred embodiments, the polar modified polymer contains the same amount of hydrophobic monomer as hydrophilic unit (1:1 ratio) or more hydrophobic monomer than hydrophilic unit. According to particularly preferred embodiments, the polar modified polymer contains 50% or less hydrophilic unit(s) (based on weight of the polymer), 40% or less hydrophilic unit(s), 30% or less hydrophilic unit(s), 20% or less
hydrophilic unit(s), 10% or less hydrophilic unit(s), 5% or less hydrophilic unit(s), 4% or less hydrophilic unit(s), or 3% or less hydrophilic unit(s).

[0073] Preferably, the polar modified polymer has from about 0.5% to about 10% hydrophilic units, more preferably from about 1% to about 8% hydrophilic units by weight with respect to the weight of the polymer, including all ranges and subranges therebetween. Particularly preferred hydrophilically modified polymers are ethylene and/or propylene homopolymers and copolymers which have been modified with maleic anhydride units.

[0074] According to preferred embodiments of the present invention, the polar modified polymer is a wax. According to particularly preferred embodiments, the polar modified wax is made via metallocene catalysis, and includes polar groups or units as well as a hydrophobic backbone. Suitable modified waxes include those disclosed in U.S. patent application publication no. 20070031361, the entire contents of which is hereby incorporated by reference. Particularly preferred polar modified waxes are C2-C3 polar modified waxes.

[0075] In accordance with preferred embodiments of the present invention, the polar modified wax is based upon a homopolymer and/or copolymer wax of hydrophobic monomers and has 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. Also, the polar modified wax preferably has a melting point above 75°C, more preferably above 90°C such as, for example, a melting point between 90°C and 160°C, preferably between 100°C and 150°C, including all ranges and subranges therebetween.

[0076] In the case of a copolymer wax, it is preferable to have, based on the total weight of the copolymer backbone, 0.1 to 30% 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.

[0077] 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 A 1, 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.

[0078] Acceptable polar modified waxes include, but are not limited to, homopolymers and/or copolymers of ethylene and/or propylene groups which have been modified with hydrophilic units such as, for example, maleic anhydride, acrylate, methacrylate, polyvinylpyrrolidone (PVP), etc. Preferably, the C2-C3 wax has from about 0.5% to about 10% hydrophilic units, more preferably from about 1% to about 8% hydrophilic units by weight with respect to the weight of the wax, including all ranges and subranges therebetween. Particularly preferred hydrophilically modified waxes are ethylene and/or propylene homopolymers and copolymers which have been modified with maleic anhydride units.

[0079] Particularly preferred C2-C3 polar modified waxes for use in the present invention are polypropylene and/or polyethylene-maleic anhydride modified waxes ("PEMA," "PPMA." "PEPPMA") commercially available from Clariant under the trade name LICOCARE or LICOCENE, Specific examples of such waxes include products marketed by Clariant under the LicoCare name having designations such as PP207.

[0080] Other suitable polar modified polymers include, but are not limited to A-C 573 A (ETHYLENE-MALEIC ANHYDRIDE COPOLYMER; Drop Point, Mettler : 106°C) from Honeywell, A-C 596 A (PROPYLENE-MALEIC ANHYDRIDE COPOLYMER; Drop Point, Mettler : 143°C) from Honeywell, A-C 597 (PROPYLENE-MALEIC ANHYDRIDE COPOLYMER; Drop Point, Mettler : 141° C) from Honeywell, ZeMac® copolymers (from VERTELLUS) which are 1:1 copolymers of ethylene and maleic anhydride,
polyisobutylene-maleic anhydride sold under the trade name ISOBAM (from Kuraray), polyisoprene-graft-maleic anhydride sold by Sigma Aldrich, poly(maleic anhydride-octadecene) sold by Chevron Philips Chemical Co., poly (ethylene-co-butyl acrylate-co-maleic anhydride) sold under the trade name of Lotader (e.g. 2210, 3210, 4210, and 3410 grades) by Arkema, copolymers in which the butyl acrylate is replaced by other alkyl acrylates (including methyl acrylate [grades 3430, 4404, and 4503] and ethyl acrylate [grades 6200, 8200, 3300, TX 8030, 7500, 5500, 4700, and 4720] also sold by Arkema under the Lotader name, and isobutylene maleic anhydride copolymer sold under the name ACO-5013 by ISP.

[0081] According to other embodiments of the present invention, the polar modified polymer is not a wax. In accordance with these embodiments of the present invention, the polar modified polymer is based upon a homopolymer and/or copolymer of hydrophobic monomer(s) and has a weight-average molecular weight Mw of less than or equal to 1,000,000 g/mol, preferably of 1000 to 250,000 g/mol and particularly preferably of 5,000 to 50,000 g/mol, including all ranges and subranges therebetween.

[0082] In accordance with these embodiments, the polar modified polymer can be of any form typically associated with polymers such as, for example, block copolymer, a grafted copolymer or an alternating copolymer. For example, the polar modified polymer can contain a hydrophobic backbone (such as polypropylene and/or polyethylene) onto which hydrophilic groups (such as maleic anhydride) have been attached by any means including, for example, grafting. The attached groups can have
any orientation (for example, atactic, isotactic or syndiotactic along the backbone).

[0083] Preferably, the polar modified polymer(s) represent from about 1% to about 30% of the total weight of the composition, more preferably from about 3% to about 20% of the total weight of the composition, and most preferably from about 5% to about 15%, including all ranges and subranges therebetween.

[0084] AQUEOUS POLYURETHANE DISPERSION

[0085] According to the present invention, compositions comprising at least one aqueous polyurethane dispersion are provided. "Aqueous polyurethane dispersion" as used herein means the aqueous polyurethane dispersions disclosed in U.S. patent 7,445,770 and/or U.S. patent 7,452,770, the entire contents of both of which are hereby incorporated by reference.

[0086] More specifically, the aqueous polyurethane dispersions of the present invention are preferably the reaction products of:

[0087] A) a prepolymer according to the formula:

\[
\begin{array}{c}
\text{OCN} - R_1 - N - C - O - R_1 - O - N - R_2 - N - C - O - R_2 - O - N - R_3\end{array}
\]

[0088] wherein \(R_1\) represents a bivalent radical of a dihydroxyl functional compound, \(R_2\) represents a hydrocarbon radical of an aliphatic or cycloaliphatic polyisocyanate, \(R_3\) represents a radical of a low molecular weight diol, optionally substituted with ionic groups, \(n\) is from 0 to 5, and \(m\) is > 1;
B) at least one chain extender according to the formula:
\[ H_2N - R_4 - NH_2 \]
wherein \( R_4 \) represents an alkylene or alkylene oxide radical not substituted with ionic or potentially ionic groups; and

C) at least one chain extender according to the formula:
\[ H_2N - R_5 - NH_2 \]
wherein \( R_5 \) represents an alkylene radical substituted with ionic or potentially ionic groups.

Suitable dihydroxyl compounds for providing the bivalent radical \( R_1 \) include those having two hydroxy groups and having number average molecular weights of from about 700 to about 16,000, and preferably from about 750 to about 5000. Examples of the high molecular weight compounds include polyester polyols, polyether polyols, polyhydroxy polycarbonates, polyhydroxy polyacetals, polyhydroxy polyacrylates, polyhydroxy polyester amides, polyhydroxy polyalkadienes and polyhydroxy polythioethers. The polyester polyols, polyether polyols and polyhydroxy polycarbonates are preferred. Mixtures of various such compounds are also within the scope of the present invention.

Suitable polyisocyanates for providing the hydrocarbon radical \( R_2 \) include organic diisocyanates having a molecular weight of from about 112 to 1,000, and preferably from about 140 to 400. Preferred diisocyanates are those represented by the general formula \( R_2(NCO)_2 \) indicated above in which \( R_2 \) represents a divalent aliphatic hydrocarbon group having from 4 to 18 carbon atoms, a divalent cycloaliphatic hydrocarbon group having from 5 to 15 carbon atoms, a divalent aliphatic hydrocarbon group having from 7 to 15 carbon atoms or a divalent aromatic hydrocarbon group having 6-15 carbon atoms. Examples of the organic
diisocyanates which are suitable include tetramethylene diisocyanate, 1,6-hexamethylene diisocyanate, dodecamethylene diisocyanate, cyclohexane-1,3- and -1,4-diisocyanate, 1-isocyanato-3-isocyanatomethyl-3,5,5-trimethylcyclohaxane (isophorone diisocyanate or IPDI), bis-(4-isocyanatocyclohexyl)-methane, 1,3- and 1,4-bis(isocyanatomethyl)-cyclohexane, bis-(4-isocyanato-3-methyl-cyclohexyl)-methane, isomers of toluene diisocyanate (TDI) such as 2,4-diisocyanatotoluene, 2,6-diisocyanatotoluene, mixtures of these isomers, hydrogenated TDI, 4,4'-diisocyanato diphenyl methane and its isomeric mixtures with 2,4'- and optionally 2,2'-diisocyanato diphenylmethane, and 1,5-diisocyanato naphthalene. Mixtures of diisocyanates can, of course, be used. Preferred diisocyanates are aliphatic and cycloaliphatic diisocyanates. Particularly preferred are 1,6-hexamethylene diisocyanate and isophorone diisocyanate.

[0093] "Low molecular weight diols” in the context of R₃ means diols having a molecular weight from about 62 to 700, preferably 62 to 200. They may contain aliphatic, alicyclic or aromatic groups. Preferred compounds contain only aliphatic groups. The low molecular weight diols having up to about 20 carbon atoms per molecule include ethylene glycol, diethylene glycol, propane 1,2-diol, propane 1,3-diol, butane 1,4-diol, butylene 1,3-glycol, neopentyl glycol, butyl ethyl propane diol, cyclohexane diol, 1,4-cyclohexane dimethanol, hexane 1,6-diol, bisphenol A (2,2-bis(4-hydroxyphenyl)propane), hydrogenated bisphenol A (2,2-bis(4-hydroxycyclohexyl)propane), and mixtures thereof. Optionally, the low molecular weight diols may contain ionic or potentially ionic groups. Suitable lower molecular weight diols containing ionic or potentially ionic
groups are those disclosed in U.S. Pat. No. 3,412,054, the contents of which is hereby incorporated by reference. Preferred compounds include dimethylol butanoic acid (DMBA), dimethylol propionic acid (DMBA) and carboxyl-containing caprolactone polyester diol. If lower molecular weight diols containing ionic or potentially ionic groups are used, they are preferably used in an amount such that <0.30 meq of COOH per gram of polyurethane in the polyurethane dispersion are present.

[0094] The prepolymer is chain extended using two classes of chain extenders. First, compounds having the formula: $\text{H}_2\text{N} - \text{R}_4\text{—NH}_2$
wherein $\text{R}_4$ represents an alkylene or alkylene oxide radical not substituted with ionic or potentially ionic groups. Alkylene diamines include hydrazine, ethylenediamine, propylenediamine, 1,4-butylenediamine and piperazine. The alkylene oxide diamines include 3-[2-[2-(3-aminopropoxy)ethoxy]ethoxy]propylamine (also known as dipropylamine diethyleneglycol or DPA-DEG available from Tomah Products, Milton, Wis.), 2-methyl-1,5-pentanediame (Dytec A from DuPont), hexane diamine, isophorone diamine, and 4,4-methylenei-(cyclohexylamine), and the DPA-series ether amines available from Tomah Products, Milton, Wis., including dipropylamine propyleneglycol, dipropylamine dipropyleneglycol, dipropylamine tripropyleneglycol, dipropylamine poly(propylene glycol), dipropylamine ethyleneglycol, dipropylamine poly(ethylene glycol), dipropylamine 1,3-propane diol, dipropylamine 2-methyl-1,3-propane diol, dipropylamine 1,4-butane diol, dipropylamine 1,3-butane diol, dipropylamine 1,6-hexane diol and dipropylamine cyclohexane-1,4-dimethanol. Mixtures of the listed diamines may also be used.
The second class of chain extenders are compounds having the formula: \( H_2N-R_5-NH_2 \) wherein \( R_5 \) represents an alkylenic radical substituted with ionic or potentially ionic groups. Such compounds have an ionic or potentially ionic group and two groups that are reactive with isocyanate groups. Such compounds contain two isocyanate-reactive groups and an ionic group or group capable of forming an ionic group. The ionic group or potentially ionic group can be selected from the group consisting of ternary or quaternary ammonium groups, groups convertible into such a group, a carboxyl group, a carboxylate group, a sulfonic acid group and a sulfonate group. The at least partial conversion of the groups convertible into salt groups of the type mentioned may take place before or during the mixing with water. Specific compounds include diaminosulfonates, such as for example the sodium salt of N-(2-aminoethyl)-2-aminoethane sulfonic acid (AAS) or the sodium salt of N-(2-aminoethyl)-2-aminopropionic acid.

The polyurethane according to the invention may also include compounds which are situated in each case at the chain ends and terminate said chains (chain terminators) as described in U.S. patent 7,445,770 and/or U.S. patent 7,452,770.

Preferably, the aqueous polyurethane dispersion has a viscosity of less than 2000 mPa.s at 23°C, preferably less than 1500, preferably less than 1000, including all ranges and subranges therebetween.

Also preferably, the aqueous polyurethane dispersion has a solids content based on the weight of the dispersion of from 20% to 60%,
preferably from 25% to 55% and preferably from 30% to 50%, including all ranges and subranges therebetween.

[0099] Suitable aqueous polyurethane dispersions for use in the present invention include, but are not limited to, aqueous polyurethane dispersions sold under the BAYCUSAN® name by Bayer such as, for example, BAYCUSAN® C1000 (polyurethane-34), BAYCUSAN® C1001 (polyurethane-34), BAYCUSAN® C1003 (polyurethane-32), and BAYCUSAN® C1004 (polyurethane-35).

[00100] According to preferred embodiments, the at least one aqueous polyurethane dispersion is present in the composition of the present invention in an amount ranging from about 1 to 35% by weight, more preferably from about 2 to about 30% by weight, more preferably from about 3 to about 20% by weight based on the total weight of the composition, including all ranges and subranges within these ranges.

[00101] ALKOXYLATED FATTY ALCOHOL

[00102] According to the present invention, compositions comprising at least one alkoxylated fatty alcohol are provided. According to preferred embodiments of the present invention, compositions comprising at least two alkoxylated fatty alcohols are provided. "Alkoxylated fatty alcohol" as used herein means a compound having at least one fatty portion (8 carbon atoms or more) and at least one alkoxylated portion (-\(\text{CH}_2\_n\text{O}\_\), where \(n\) is an integer from 1 to 5, preferably 2 to 3). According to particularly preferred embodiments, the alkoxylated fatty alcohols of the present invention can be used as non-ionic surfactants, if desired. In this regard, the alkoxylated fatty alcohols of the present invention preferably
have an HLB (hydrophilic-lipophilic balance) value from 1-20, including all ranges and subranges therebetween, with HLB values ranging from 1 to 5 (particularly 3 to 5) or from 15-20 (particularly 16 to 18) being most preferred.

[00103] The alkoxylated fatty alcohol can be present in the composition of the present invention in the water and/or oil phase.

[00104] Preferably, the alkoxylated fatty alcohol can be chosen from di-alkyl, tri-alkyl- and combinations of di-alkyl and tri-alkyl substituted ethoxylated polymers. They can also be chosen from mono-alkyl, di-alkyl, tri-alkyl, tetra-alkyl substituted alkyl ethoxylated polymers and all combinations thereof. The alkyl group can be saturated or unsaturated, branched or linear and contain a number of carbon atoms preferably from about 12 carbon atoms to about 50 carbon atoms, including all ranges and subranges therebetween, for example, 20 to 40 carbon atoms, 22 to 24 carbon atoms, 30 to 50 carbon atoms, and 40 to 60 carbon atoms. Most preferably, the fatty portion contains a mixture of compounds of varying carbon atoms such as, for example, C20-C40 compounds, C22-C24 compounds, C30-C50 compounds, and C40-C60 compounds.

[00105] Preferably, the alkoxylation portion of the alkoxylated fatty alcohols of the present invention contain 2 or more alkoxylation units, preferably from 10 to 200 alkoxylation units, preferably from 20 to 150 alkoxylation units, and preferably from 25 to 100 alkoxylation units, including all ranges and subranges therebetween. Also preferably, the alkoxylation units contain 2 carbon atoms (ethoxylation units) and/or 3 carbon atoms (propoxylation units).
The amount of alkoxylation can also be determined by the percent by weight of the alkoxylated portion with respect to the total weight of the compound. Suitable weight percentages of the alkoxylated portion with respect to the total weight of the compound include, but are not limited to, 10% to 95%, preferably 20% to 90%, including all ranges and subranges therebetween with 75% to 90% (particularly 80% to 90%) or 20% to 50% being preferred.

Preferably, the alkoxylated fatty alcohols of the present invention have a number average molecular weight (Mn) greater than 500, preferably from 500 to 5,000, including all ranges and subranges therebetween such as, for example, Mn of 500 to 1,250 or an Mn of 2,000 to 5,000.

The alkyl substitution of the alkoxylated fatty alcohol can include mono-alkyl, di-alkyl, tri-alkyl and tetra-alkyl substitution of the polymer and combinations thereof. Suitable examples of mono alkyl substituted polymers include: Steareth-100 available as Brij 700 from Uniqema Inc., Pareth alcohols available as Performathox 450, 480 and 490 available from New Phase Technologies, Inc. Suitable examples of di-alkyl substituted polymers include PEG 120 methyl glucose dioleate available as Glutamate DOE-120 and Glucamate DOE-120 both from Chemron Corporation. Suitable examples of tri-alkyl substituted polymers include PEG 120 methyl glucose trioleate available as Glucamate LT from Chemron Corporation. Suitable examples of tetra-alkyl substituted polymers include PEG 150 pentaerythrityl tetraoleate available as Crothix from Croda Corporation.
Suitable alkoxylated fatty alcohols for use in the present invention include, but are not limited to, alkoxylated C20-C40 fatty alcohols sold under the PERFORMATHOX® name by New Phase Technologies such as, for example, PERFORMATHOX® 420 ETHOXYLATE (Mn = 575; 20% by weight ethoxylation), PERFORMATHOX® 450 ETHOXYLATE (Mn = 920; 50% by weight ethoxylation), PERFORMATHOX® 480 ETHOXYLATE (Mn = 2300; 80% by weight ethoxylation), PERFORMATHOX® 490 ETHOXYLATE (Mn = 4600; 90% by weight ethoxylation), PERFORMATHOX® 520 ETHOXYLATE (Mn = 690; 20% by weight ethoxylation), and PERFORMATHOX® 550 ETHOXYLATE (Mn = 1100; 50% by weight ethoxylation).

According to preferred embodiments, the at least one alkoxylated fatty alcohol is present in the composition of the present invention in an amount ranging from about 0.5 to 40% by weight, more preferably from about 2 to about 30% by weight, more preferably from about 5% to about 20% based on the total weight of the composition, including all ranges and subranges within these ranges.

According to preferred embodiments where at least two alkoxylated fatty alcohols are present, at least one alkoxylated fatty alcohol has a Mn from 500 to 1,250 and/or no more than 50% alkoxylation by weight (preferably both), and at least one alkoxylated fatty alcohol has a Mn from 2,500 to 5,000 and/or 75% to 90% alkoxylation (preferably both). So, for example, preferred combinations of alkoxylated fatty alcohols include: Performathox 420 and Performathox 490; and Performathox 520 and Performathox 490. Preferably, compositions of the present invention
comprise more alkoxylated fatty alcohol having a higher Mn and/or a higher alkoxylation content than fatty alcohol having a lower Mn and/or a lower alkoxylation content. Preferably, the weight ratio of higher Mn and/or alkoxylation content fatty alcohol to lower Mn and/or alkoxylation content fatty alcohol is from 5:1 to about 1:1, preferably from 3:1 to 2:1.

Alternatively, the ratios could be inverse of those previously set forth, preferably from 1:5 to about 1:1, preferably from 1:2 to 1:3.

[0012] The alkoxylated fatty alcohol can added to the water or oil phase of a composition. If added to the oil phase, the alkoxylated fatty alcohol can result in a smooth, creamy texture with fast product deposition. If added to the water phase, the alkoxylated fatty alcohol can result in a slightly rougher texture. Preferably, the lower hydrophile lipophile balance (HLB) valued alkoxylated fatty alcohols (e.g. Permathox 420) are added to the oil phase, while the higher hydrophile lipophile balance (HLB) valued alkoxylated fatty alcohols (e.g. Permathox 490) are added to the water phase.

[0013] According to particularly preferred embodiments, the compositions of the present invention contain more alkoxylated fatty alcohol than aqueous polyurethane dispersion on a weight basis. Particularly preferred compositions include alkoxylated fatty alcohol to aqueous polyurethane dispersion in a weight ratio of between 10:1 and 5:1 (for example, 9:1, 8:1, 7:1 and 6:1), including all ranges and subranges therebetween. However, the compositions may also contain more aqueous polyurethane dispersion than alkoxylated fatty alcohol on a weight basis in the same preferred ratios discussed above (1:10, 1:5, etc.).
According to the present invention, compositions comprising at least one polyamine compound are provided. In accordance with the present invention, the polyamine compound has at least two primary amine groups available to react with hydrophilic groups of the oil-soluble polar modified polymer.

According to particularly preferred embodiments, the polyamine compound is a polyalkyleneimine, preferably a C2-C5 polyalkyleneamine compound, more preferably a polyethyleneimine or polypropyleneimine. Most preferably, the polyalkyleneimine is polyethyleneimine ("PEI"). The polyalkyleneimine compound preferably has an average molecular weight range of from 500-200,000, including all ranges and subranges therebetween.

According to preferred embodiments, compositions of the present invention contain polyethyleneimine compounds in the form of branched polymers. Commercially available examples of such polymers are available from BASF under the tradename LUPASOL or POLYIMIN. Non-limiting examples of such polyethyleneimines include Lupasol® PS, Lupasol® PL, Lupasol® PR8515, Lupasol® G20, Lupasol® G35.

According to other embodiments of the present invention, polyamines such as polyethyleneimines and polypropyleneimines can be in the form of dendrimers. Non-limiting examples of such dendrimers are manufactured by the company DSM, and/or are disclosed in U.S. Pat. No. 5,530,092 and U.S. Pat. No. 5,610,268, the contents of which are hereby incorporated by reference. Commercially available examples of such
polymers include polyamidoamine or polypropyleneimine polymers from DENDRITECH sold under the STARBURST® name.

[001 19] According to other embodiments of the present invention, derivatives of polyalkyleneamines are suitable polyamines. Such derivatives include, but are not limited to, alkylated derivatives, the addition products of alkylcarboxylic acids to polyalkyleneamines, the addition products of ketones and of aldehydes to polyalkyleneamines, the addition products of isocyanates and of isothiocyanates to polyalkyleneamines, the addition products of alkylene oxide or of polyalkylene oxide block polymers to polyalkyleneamines, quaternized derivatives of polyalkyleneamines, the addition products of a silicone to polyalkyleneamines, and copolymers of dicarboxylic acid and polyalkyleneamines. Even further suitable polynamines include, but are not limited to, polyvinylimidazoles (homopolymers or copolymers), polyvinylpyridines (homopolymers or copolymers), compounds comprising vinylimidazole monomers (see, for example, U.S. Pat. No. 5,677,384, hereby incorporated by reference), and polymers based on amino acids containing a basic side chain (preferably selected from proteins and peptides comprising at least 5%, preferably at least 10% of amino acids selected from histidine, lysine and arginine). Such suitable polyamines as described above include those disclosed and described in U.S. patent 6,162,448, the contents of which are hereby incorporated by reference. Commercially available examples of such polymers include polyvinylamine/formamide such as those sold under the Lupamine® name by BASF, chitosan from vegetable origin such as those
sold under the Kiosmetine® or Kitozyme® names, or copolymer 845 sold by ISP.

[00120] According to preferred embodiments, the at least one polyamine compound is present in the composition of the present invention in an amount ranging from about 0.05 to about 20% by weight, preferably from about 0.25 to about 10% by weight, preferably from about 0.3 to about 5% by weight, preferably from about 0.5 to about 3% by weight, based on the total weight of the composition, including all ranges and subranges within these ranges.

[00121] Preferably, the amount of polyamine compound reacted with the oil-soluble polar modified polymer is such that at least two amine groups on the polyamine compound react with the oil-soluble polar modified polymer to form links or bonds between the amine groups and the hydrophilic groups of the oil-soluble polar modified polymer. The appropriate amount of polyamine compound to react with the oil-soluble polar modified polymer to obtain a reaction product can be easily determined, taking into account the number/amount of reactive amine groups on the polyamine compound and the number/amount of corresponding reactive groups on the oil-soluble polar modified polymer (for example, maleic anhydride groups). According to preferred embodiments, excess oil-soluble polar modified polymer (as determined by the relative number/amount of corresponding reactive groups on the polymer as compared to the reactive amine groups on the polyamine) is reacted with polyamine. Preferably, the polyamine to oil-soluble polar modified ratio is
between 0.005 and 1, preferably between 0.006 and 0.5, and preferably between 0.007 and 0.1, including all ranges and subranges therebetween.

[00122] According to preferred embodiments, the at least one polyamine compound is present in the composition of the present invention in an amount ranging from about 0.25 to about 10% by weight, preferably from about 0.3 to about 5% by weight, preferably from about 0.5 to about 3% by weight, based on the total weight of the composition, including all ranges and subranges within these ranges.

[00123] Reaction Product

[00124] According to preferred embodiments of the present invention, the oil-soluble polar modified polymer is reacted with the polyamine compound, in the presence of water in, at minimum, an amount sufficient to solubilize the polyamine, to form a reaction product. In accordance with the preferred embodiments, the reaction product is water-insoluble.

[00125] Although not wanting to be bound by any particular theory, it is believed that at a temperature below 100°C, the reaction of the oil-soluble polar modified polymer with the primary amine group of the polyamine opens the anhydride ring to form a half acid and half amide crosslinked product. However, at a temperature above 100°C, the reaction of the oil-soluble polar modified polymer with the primary amine group of the polyamine opens the anhydride ring to form an imide crosslinked product. The former product is preferred over the latter product. It is not necessary for all amine groups and all hydrophilic groups to react with each other to form the reaction product. Rather, it is possible that the composition may
contain free polyamine and/or free oil-soluble polar modified polymer in addition to the reaction product.

[00126] Although not wanting to be bound by any particular theory, it is also believed that the polyamine(s) can be non-covalently assembled with the polar modified polymer(s) by electrostatic interaction between an amine group of the polyamine and a hydrophilic group (for example, carboxylic acid group associated with maleic anhydride groups) of the polar modified polymer to form a supramolecule. For example, with specific reference to maleic anhydride groups, in the presence of water these groups can open to form dicarboxylic acid groups which can interact with protonated primary amines of the polyamine through ionic interaction to form a polymer-polymer complex with hydrophilic core crosslinkers and a hydrophobic network that act as supramolecular capsule. If a large amount of maleic anhydride groups are present, the secondary amine groups of polyamine are also protonated and interact with alkyl carboxylates.

[00127] According to preferred embodiments, the oil-soluble polar modified polymer is in an oil carrier, and the polyamine compound is in an aqueous carrier, and the reaction occurs by combining the oil carrier and the aqueous carrier. Because the oil-soluble polar modified polymer is typically solid at room temperature, the oil carrier is preferably heated to liquefy the polymer prior to combination with the aqueous carrier. Preferably, the oil carrier is heated beyond the melting point of the oil-soluble polar modified polymer, typically up to about 80°C, 90°C or 100°C.

[00128] Without intending to be bound by any particular theory, it is believed that the reason for this is that due to the chemical and physical
reactions which take place when the oil-soluble polar modified polymer is
combined with the polyamine, the subsequent reaction product that is
formed is surprisingly and unexpectedly able to entrap large amounts of
water molecules within its hydrophobic matrix. Since it is believed that water
is entrapped in the system, it is believed that when the topcoat is applied,
water can be released slowly over a longer period of time so that a better
volume (swelling) retention of the basecoat can be achieved. The resultant
product is eminently capable of forming a film, is self-emulsifying,
waterproof. Moreover, the product is both stable and capable of carrying
various types of ingredients.

[00129] According to other preferred embodiments of the present
invention, the oil-soluble polar modified polymer is reacted with the
alkoxylated fatty alcohol, in the presence of oil to form a reaction product. If
the reaction is conducted at a relatively high temperature (for example,
above 140°C) and for a long period of time (>5 hours), a significant amount
of the hydrophilic group (for example, carboxylic acid group associated with
maleic anhydride groups) of the oil soluble polar modified polymer reacts
with hydroxyl group(s) of the alkoxylated fatty alcohol to yield a significant
amount of the reaction product. If, however, the reaction is conducted at a
relatively low temperature (for example, below 100°C) and for a short period
of time (<1 hour), only a small portion of the hydrophilic group of the polar
modified polymer reacts with hydroxyl group(s) of the alkoxylated fatty
alcohol to yield a minor amount of reaction product. Depending upon
desired application, a minor amount or a significant amount of the reaction
product may be desired.
According to preferred embodiments of the present invention, topcoat compositions comprising water are provided. According to preferred embodiments, sufficient water is present to allow formation of an emulsion composition such as, for example, an oil-in-water emulsion or a water-in-oil emulsion. Typically, the amount of water present in the compositions of the present invention ranges from about 5 to 80% by weight, more preferably from about 10 to about 70% by weight, more preferably from about 20 to about 60% by weight based on the total weight of the composition, including all ranges and subranges within these ranges.

Additional additives

The composition of the invention can also comprise any additive usually used in the field under consideration. For example, dispersants such as colorants, poly(12-hydroxystearic acid), antioxidants, film forming agents, 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, silicone elastomers, pasty compounds, viscosity increasing agents such as waxes or liposoluble/lipodispersible polymers, 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

[00134] 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.

[00135] 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.

[00136] 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.

[00137] 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 human beings.

[00138] According to preferred embodiments of the present invention, basecoat and/or topcoat compositions further comprising at least one coloring agent are provided. Preferably, such colored compositions can be cosmetic compositions such as, for example, lip compositions (for example, lipstick or liquid lip colors), mascaras, nail polish or foundations.

[00139] 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.
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%, including all ranges and subranges therebetween.

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.

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.

[00143] 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.

[00144] According to preferred embodiments of the present invention, cosmetic systems comprising a basecoat comprising at least one acrylic thickener and at least one fatty substance, and a topcoat comprising at least one aqueous polyurethane dispersion, at least one polar modified polymer, at least one alkoxyalted fatty alcohol, and at least one polyamine compound are provided. Preferably, the basecoat composition is anhydrous and the topcoat composition is in the form of a water-in-oil emulsion gel.

[00145] According to preferred embodiments of the present invention, methods of treating, caring for and/or making up keratinous material (for example, skin, eyes, eyelashes or lips) by applying the basecoat composition of the present invention to the keratinous material and then applying the topcoat composition of the present invention to the basecoat composition in an amount sufficient to treat, care for and/or make up the keratinous material are provided. Preferably, these methods comprise exposing the applied basecoat composition to water in the topcoat composition in an amount sufficient to swell the acrylic thickener in the basecoat composition. 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.

[00146] According to preferred embodiments of the present invention, methods of enhancing the appearance of keratinous material (for example, skin, eyes, eyelashes, or lips) by applying the basecoat composition of the present invention to the keratinous material and then applying the topcoat composition of the present invention to the basecoat composition in an amount sufficient to enhance the appearance of the keratinous material are provided. Preferably, these methods comprise exposing the applied basecoat composition to water in the topcoat composition in an amount sufficient to swell the acrylic thickener in the basecoat composition.

[00147] According to preferred embodiments of the present invention, methods of volumizing eyelashes comprising applying the basecoat composition of the present invention to eyelashes and then applying the topcoat composition of the present invention to the basecoat composition to expose the applied basecoat composition (mascara) to water in an amount sufficient to swell the acrylic thickener in an amount sufficient to volumize the eyelashes are provided.

[00148] In accordance with the preceding preferred embodiments, the basecoat compositions of the present invention comprising at least one acrylic thickener 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.

[00149] Also in accordance with the preceding preferred embodiments, these methods further comprise exposing the applied composition to a topcoat composition comprising water in an amount sufficient to swell the acrylic thickener. Preferably, such exposure to water occurs after the applied composition has dried. According to preferred embodiments, the basecoat composition is anhydrous. The amount of water to which the applied composition is exposed is sufficient to cause the acrylic thickener to swell but insufficient to facilitate removal of the applied composition.

[00150] According to preferred embodiments, the basecoat and topcoat compositions of the present invention are present in a kit.

[00151] 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.

[00152] 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.

[00153] Examples

[00154] Example 1 - - Base Coat with Swelling Agent

<table>
<thead>
<tr>
<th>Phase</th>
<th>Chemical Name</th>
<th>Comparative</th>
<th>Inventive</th>
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<td>A</td>
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<td>B</td>
<td>Polysorbate 80</td>
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</tr>
<tr>
<td>E</td>
<td>Mexoryl SAP</td>
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<tr>
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<tr>
<td>Total</td>
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</table>
Note * sodium acrylate/ Sodium Acryloyldimethyl Taurate Copolymer is supplied as 42.5% actives ingredients in solvents

Procedure

In the main beaker, Combine Phase A, heat to 90-95C, homogenize for 45 minutes until the pigments get dispersed uniformly.

Add Distearidimonium Hectorite to main beaker, mix about 15minut.es. Add polysorbate 20 and polysorbate 30 and then mix for another 10minutes.

Add Propylene Carbonate and mix for 10 minutes

Add Sodium Acrylate// Sodium Acryloyldimethyl Taurate Copolymer and mix for 10 minutes

Switch to paddle mixing. Add E and F at 30-35C to form composition.

Example 2 -- Water in Oil Emulsion Gel Topcoat

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<th>C</th>
<th>D</th>
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<td>%</td>
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</tbody>
</table>

* Polylene ethylene MALEIC ANHYDRIDE COPOLYMER is supplied in 25% isohexadecane.

** PEI-35 is supplied in 50% water.
[00162] In beaker A, add all phase A materials. Heat content to 90°C until all the solids melt.

[00163] Add iron oxide and start homogenizing the main beaker for 1 hour.

[00164] In beaker B, add all phase B materials. Heat to 90°C and mix for 20 minutes.

[00165] Combine Phase B and Phase A, homogenize at 850 RPM for 20 minutes.

[00166] Switch to planetarian blade and add Baycusan polyurethane dispersion at 45-50°C

[00167] Add Phenoxyethanol at around 40°C, continue cooling to 25°C.

[00168] Example 3 -- Application of Example 1 and 2 Compositions to Eyelashes

[00169] Both the invention basecoat and the comparative basecoat were applied on fake lashes for 15 strokes. After 20-30 seconds, the topcoat was applied for 15 strokes to both basecoats. The fake lashes were analyzed under the optical microscope and the diameter of the lashes was measured. It was observed that the inventive composition shows more perceivable swelling compared to the comparative composition. After 5 hours, as solvents evaporated, the volume reduced for both compositions. However, the inventive composition still showed slightly better volume retention compared to the comparative composition. These results are depicted visually in Figure 1, and graphically in Figure 2.
Example 4 - Application of Example 1 and 2

Compositions to Eyelashes as Compared to Commercial products

Both the invention basecoat and the comparative basecoat were applied on both consumer eyelashes and fake lashes as described above. Also commercial products having the following ingredients listing on their packages were applied to eyelashes:

Commercial Product A --

Commercial Product B --
Aqua/Water, Paraffin, Potassium Cetyl Phosphate, Cera Alba/Beeswax, Cera Carnauba/Carnauba Wax, Acacia Senegal/Avacia Senegal Gum, Glycerin, Cetyl Alcohol, Hydroxyethylcellulose, Sodium Polymethacrylate, Hydrogenated Jojoba Oil, Hydrogenated Palm Oil, Phenethyl Alcohol, Phenoxyethanol, Steareth-20, PEG/PPG-17/18 Dimethicone, Polyquaternium-10, Silica, Soluble Collagen, Simethicone, Panthenol, Disodium EDTA. May Contain: CI 77499, CI 77492, CI 77491/Iron Oxides, CI 77891/Titanium Dioxide, CI 77007/Ultramarines, CI 77288/Chromium Oxide Greens, CI 77289/Chromium Hydroxide Green, CI 77742/Manganese Violet, CI 77510/Ferric Ferrocyanide, Mica.

After 5 hours of wear, the invention compositions and the commercial products were reapplied on fake lashes as well as on consumer’s eye lashes. The invention compositions had significant product buildup (average diameter on fake lashes increased from 0.17 to 0.22), while the comparative commercial products showed lower diameter. Results are in Figure 3. Also, reapplication of the invention compositions was smoother and easier than for the commercial products.
WHAT IS CLAIMED IS:

1. A cosmetic system comprising a basecoat composition comprising at least one acrylic thickener and at least one fatty substance, and a topcoat composition comprising at least one aqueous polyurethane dispersion, at least one oil-soluble polar modified polymer, at least one alkoxylated fatty alcohol, and at least one polyamine compound.

2. The system of claim 1, wherein the basecoat composition and/or the topcoat composition further comprises at least one coloring agent.

3. The system of claim 1, wherein the topcoat composition comprises at least two alkoxylated fatty alcohols.

4. The system of claim 1, wherein the at least one oil-soluble polar modified polymer is present in the topcoat composition in an amount of from 1% to 30% of the total weight of the composition.

5. The system of claim 1, wherein the oil-soluble polar modified polymer is a polypropylene and/or polyethylene-maleic anhydride modified wax.

6. The system of claim 1, wherein the alkoxylated fatty alcohol(s) is present in the topcoat composition in an amount of from 0.5% to 40% by weight, based on the weight of the composition.

7. The system of claim 1, wherein the at least one aqueous polyurethane dispersion comprises a hydrophilic portion.
8. The system of claim 1, wherein the at least one aqueous polyurethane dispersion is selected from the group consisting of polyurethane-34, polyurethane-35 and polyurethane-32.

9. The system of claim 1, wherein the basecoat composition is in the form of a mascara.

10. The system of claim 1, wherein the basecoat composition is anhydrous.

11. The system of claim 1, wherein the fatty substance is at least one wax.

12. The composition of claim 11, wherein the at least one acrylic thickener and the at least one wax are present in a weight ratio of from 1:3 to 1:15.

13. A method of making up eyelashes comprising applying the cosmetic system of claim 1 to the eyelashes.

14. A method of volumizing eyelashes comprising applying the cosmetic system of claim 1 to the eyelashes.

15. A kit comprising the cosmetic system of claim 1.
<table>
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<tr>
<th>Base</th>
<th>Initial Volume After Top Coat</th>
<th>Volume Retention 5H</th>
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<tbody>
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<td>Without Viscup EZ comparative</td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>With Viscup EZ Inventive</td>
<td><img src="image3" alt="Image" /></td>
<td><img src="image4" alt="Image" /></td>
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Fig. 1