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(54) Title: SKIN CARE FORMULATION

(57) Abstract: A skin care formulation is provided comprising: a film forming polymer, wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group; wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24; wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3; and wherein the functionalized maltodextrin is free of vinylic carbon.



SKIN CARE FORMULATION

[0001] The present invention relates to a skin care formulation. In particular, the present invention relates to a skin care formulation including a film forming polymer, wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group; wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24; wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3; and wherein the functionalized maltodextrin is free of vinylic carbon.

[0002] Many skin care compositions, including pigmented cosmetics (e.g., foundations, concealers, lipsticks, mascaras) and sunscreens, have been developed for longer wear and transfer resistance properties. These properties are often accomplished by the use of compositions that form a film after application. Such compositions generally contain volatile solvents, which evaporate on contact with the skin or other keratinous tissue, leaving behind a layer comprising waxes and/or resins, pigments, fillers, and actives. Conventional film formers having desirable esthetic characteristics, for example, polyvinyl pyrrolidone, acrylates, acrylamides and copolymers thereof all tend not to offer the sustainable solution brand owners and consumers now seek.

[0003] Accordingly, there remains a need for new film forming ingredients that facilitate the need for improved long-wearing skin care formulations while simultaneously having an increased bio carbon content when compared to conventional film forming ingredients.

[0004] The present invention provides a skin care formulation, comprising: a film forming polymer, wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group; wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24; wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3; and wherein the functionalized maltodextrin is free of vinylic carbon.

DETAILED DESCRIPTION

[0005] We have surprisingly found a film forming polymer, wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group; wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24; wherein the functionalized maltodextrin has a degree of

substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3; and wherein the functionalized maltodextrin is free of vinylic carbon. The film forming polymer of the present invention is a biobased material. Moreover, we have surprisingly found that the film forming polymer of the present invention provides water and sebum resistance facilitating long wear products such as color cosmetics, sun care formulations and antiperspirant/deodorants with desirable aesthetic characteristics.

[0006] Unless otherwise indicated, ratios, percentages, parts, and the like are by weight.

[0007] The term “dextrose equivalent, DE” as used herein and in the appended claims refers to the degree of starch hydrolysis, specifically, the reducing value of a starch hydrolysate material compared to the reducing value of an equal weight of dextrose, expressed as percent, dry basis, as measured by the Lane and Eynon method described in Standard Analytical Method E-26, Corn Refiners Association, 6th edition, 1977, E-26, pp. 1-3. For example, a maltodextrin with a DE of 10 would have 10% of the reducing power of dextrose which has a DE of 100.

[0008] The term “vinylic carbon” as used herein and in the appended claims refers to a carbon that is involved in a double bond with another carbon.

[0009] The term “free of vinylic carbon” as used herein and in the appended claims in reference to the functionalized maltodextrin means that the functionalized maltodextrin contains less than the detectable limit of vinylic carbon.

[0010] The term "dermatologically acceptable" as used herein and in the appended refers to ingredients typically used in personal care compositions and is intended to underscore that materials that are toxic when present in the amounts typically found in personal care compositions are not contemplated as part of the present invention.

[0011] The term “aesthetic characteristics” as used herein and in the appended claims in reference to a skin care formulation refers to visual and tactile sensory properties (e.g., smoothness, tack, lubricity, texture, color, clarity, turbidity, uniformity).

[0012] Preferably, the skin care formulation of the present invention is selected from the group consisting of a color cosmetic formulation, a sun care formulation, a hand cream, a skin cream, a face cream, an anti-perspirant formulation and a deodorant formulation. More preferably, the skin care formulation of the present invention is selected from the group consisting of a color cosmetic formulation, a sun care formulation, an anti-perspirant and a deodorant formulation. Most preferably, the skin care formulation of the present invention is a color cosmetic formulation.

[0013] Preferably, the skin care formulation of the present invention is provided in a product form selected from the group consisting of a cream, a non-aqueous solution, an emulsion, an oil, an ointment, a paste, a gel, a lotion, a milk, a foam, a stick and a suspension. More preferably, the skin care formulation of the present invention is provided as an emulsion.

[0014] Preferably, the skin care formulation of the present invention, comprises: a film forming polymer (preferably, 0.1 to 100 wt% (more preferably, 0.5 to 50 wt%; still more preferably, 1 to 25 wt%; most preferably, 1.5 to 7.5 wt%), based on weight of the skin care formulation, of the film forming polymer), wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group; wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24 (preferably, 1 to 20; more preferably, 1 to 18; still more preferably, 1 to 15; most preferably, 1); wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3 (preferably, 1.8 to 3; more preferably, 2 to 3; most preferably, 2.1 to 2.8); and wherein the functionalized maltodextrin is free of vinylic carbon; optionally, a dermatologically acceptable carrier (preferably, 0 to 98 wt% (more preferably, 30 to 92 wt%; still more preferably, 35 to 90 wt%; most preferably, 40 to 80 wt%), based on weight of the skin care formulation, of the dermatologically acceptable carrier); optionally, a color ingredient (preferably, 0 to 90 wt% (more preferably, 0.01 to 65 wt%; still more preferably, 1 to 50 wt%; most preferably, 5 to 25 wt%), based on weight of the skin care formulation, of the color ingredient); and optionally, a sun care active (preferably, 0 to 70 wt% (more preferably, 0.1 to 65 wt%; still more preferably, 5 to 60 wt%; most preferably, 10 to 25 wt%), based on weight of the skin care formulation, of the sun care active). More preferably, the skin care formulation of the present invention, comprises: a film forming polymer (preferably, 0.1 to 100 wt% (more preferably, 0.5 to 50 wt%; still more preferably, 1 to 25 wt%; most preferably, 1.5 to 7.5 wt%), based on weight of the skin care formulation, of the film forming polymer), wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein the $-\text{Si}(\text{R}^1)_3$ groups are linked to the maltodextrin base polymer through a C-O-Si bond; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group; wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24 (preferably, 1 to 20; more preferably, 1 to 18; still more preferably, 1 to 15; most preferably, 1); wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3 (preferably, 1.8 to 3; more preferably, 2 to 3; most preferably, 2.1 to 2.8); and wherein the

functionalized maltodextrin is free of vinylic carbon; optionally, a dermatologically acceptable carrier (preferably, 0 to 98 wt% (more preferably, 30 to 92 wt%; still more preferably, 35 to 90 wt%; most preferably, 40 to 80 wt%), based on weight of the skin care formulation, of the dermatologically acceptable carrier); optionally, a color ingredient (preferably, 0 to 90 wt% (more preferably, 0.01 to 65 wt%; still more preferably, 1 to 50 wt%; most preferably, 5 to 25 wt%), based on weight of the skin care formulation, of the color ingredient); and optionally, a sun care active (preferably, 0 to 70 wt% (more preferably, 0.1 to 65 wt%; still more preferably, 5 to 60 wt%; most preferably, 10 to 25 wt%), based on weight of the skin care formulation, of the sun care active).

[0015] Preferably, the skin care formulation of the present invention, comprises 0.1 to 100 wt% (preferably, 0.5 to 50 wt%; more preferably, 1 to 25 wt%; most preferably, 1.5 to 7.5 wt%), based on weight of the skin care formulation, of a film forming polymer; wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group (preferably, a methyl group, an ethyl group, a propyl group, a butyl group and a pentyl group; more preferably, a methyl group, an ethyl group, a propyl group and a butyl group; still more preferably, a methyl group, an ethyl group and a propyl group; yet more preferably, a methyl group and an ethyl group; most preferably, a methyl group); wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24 (preferably, 1 to 20; more preferably, 1 to 18; still more preferably, 1 to 15; most preferably, 1); wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3 (preferably, 1.8 to 3; more preferably, 2 to 3; most preferably, 2.1 to 2.8); and wherein the functionalized maltodextrin is free of vinylic carbon. More preferably, the skin care formulation of the present invention, comprises 0.1 to 100 wt% (preferably, 0.5 to 50 wt%; more preferably, 1 to 25 wt%; most preferably, 1.5 to 7.5 wt%), based on weight of the skin care formulation, of a film forming polymer; wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein the $-\text{Si}(\text{R}^1)_3$ groups are linked to the maltodextrin base polymer through a C-O-Si bond; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group (preferably, a methyl group, an ethyl group, a propyl group, a butyl group and a pentyl group; more preferably, a methyl group, an ethyl group, a propyl group and a butyl group; still more preferably, a methyl group, an ethyl group and a propyl group; yet more preferably, a methyl group and an ethyl group; most preferably, a methyl group); wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to

24 (preferably, 1 to 20; more preferably, 1 to 18; still more preferably, 1 to 15; most preferably, 1); wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3 (preferably, 1.8 to 3; more preferably, 2 to 3; most preferably, 2.1 to 2.8); and wherein the functionalized maltodextrin is free of vinylic carbon.

[0016] Preferably, the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24 (preferably, 1 to 20; more preferably, 1 to 18; still more preferably, 1 to 15; most preferably, 1). More preferably, the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24 (preferably, 1 to 20; more preferably, 1 to 18; still more preferably, 1 to 15; most preferably, 1); wherein the maltodextrin base polymer is a straight or branched chain maltodextrin polymer comprising a plurality of glucose structural units. Most preferably, the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24 (preferably, 1 to 20; more preferably, 1 to 18; still more preferably, 1 to 15; most preferably, 1); wherein the maltodextrin base polymer is a straight or branched chain maltodextrin polymer comprising a plurality of glucose structural units; wherein 90 to 100 mol% (preferably, 92 to 100 mol%; more preferably, 93 to 100 mol%; most preferably, 94.5 to 100 mol%) of the glucose structural units are connected by α -1,4 linkages and 0 to 10 mol% (preferably, 0 to 8 mol%; more preferably, 0 to 7 mol%; most preferably, 0 to 5.5 mol%) of the glucose structural units are connected by α -1,6 linkages.

[0017] Preferably, the maltodextrin base polymer contains less than 0.01 wt%, based on weight of the maltodextrin base polymer, of alternan. More preferably, the maltodextrin base polymer contains less than 0.001 wt%, based on weight of the maltodextrin base polymer, of alternan. Most preferably, the maltodextrin base polymer contains less than the detectable limit of alternan.

[0018] Preferably, < 0.1 mol% (preferably, < 0.01 mol%; more preferably, < 0.001 mol%; most preferably, < detectable limit) of the glucose structural units in the maltodextrin base polymer are connected by β -1,4 linkages.

[0019] Preferably, < 0.1 mol% (preferably, < 0.01 mol%; more preferably, < 0.001 mol%; most preferably, < detectable limit) of the glucose structural units in the maltodextrin base polymer are connected by β -1,3 linkages.

[0020] Preferably, the skin care formulation of the present invention, comprises 0 to 98 wt% (preferably, 30 to 92 wt%; more preferably, 35 to 90 wt%; most preferably, 40 to 80), based on weight of the skin care formulation, of a dermatologically acceptable carrier. More preferably, the skin care formulation of the present invention, comprises 0 to 98 wt% (preferably, 30 to 92 wt%; more preferably, 35 to 90 wt%; most preferably, 40 to 80), of a

dermatologically acceptable carrier; wherein the dermatologically acceptable carrier is selected from the group consisting of water; glycols (e.g., ethylene glycol, propylene glycol, butylene glycol, pentylene glycol, hexylene glycol, dipropylene glycol, ethoxydiglycol); C₁₋₁₀ straight or branched chain alcohols (e.g., methyl alcohol, ethyl alcohol, propyl alcohol, isopropyl alcohol, butyl alcohol, 2-butoxyethanol); ketones (e.g., acetone); acetates (e.g., methyl acetate); butyl cellulose; dimethicones; polydimethylsiloxanes; alkanes (e.g., isododecane, isohexane); alkanoates (e.g., methyl undecanoate), dermatologically acceptable hydrophobic ester oils (e.g., caprylic capric triglycerides); dicaprylyl carbonate; alkyl benzoates (e.g., C₁₂₋₁₅ alkyl benzoate); hemisqualane; dioctylether; keto acids (e.g., levulinic acid) and mixtures thereof. Still more preferably, the skin care formulation of the present invention, comprises 0 to 98 wt% (preferably, 30 to 92 wt%; more preferably, 35 to 90 wt%; most preferably, 40 to 80), of a dermatologically acceptable carrier; wherein the dermatologically acceptable carrier is selected to be capable of evaporating upon application of the skin care formulation to the skin (preferably, human skin). Most preferably, the skin care formulation of the present invention, comprises 0 to 98 wt% (preferably, 30 to 92 wt%; more preferably, 35 to 90 wt%; most preferably, 40 to 80), of a dermatologically acceptable carrier; wherein the dermatologically acceptable carrier includes isododecane; and wherein the dermatologically acceptable organic carrier is selected to be capable of evaporating upon application of the skin care formulation to the skin (preferably, human skin).

[0021] Preferably, the skin care formulation of the present invention comprises 0 to 90 wt% (preferably, 0.01 to 65 wt%; more preferably, 1 to 50 wt%; preferably, 5 to 25 wt%), based on weight of the skin care formulation, of a color ingredient. More preferably, the skin care formulation of the present invention comprises 0 to 90 wt% (preferably, 0.01 to 65 wt%; more preferably, 1 to 50 wt%; preferably, 5 to 25 wt%), based on weight of the skin care formulation, of a color ingredient; wherein the color ingredient is selected from the group consisting of inorganic pigments, organic pigments, aqueous pigment dispersions and mixtures thereof. Still more preferably, the skin care formulation of the present invention comprises 0 to 90 wt% (preferably, 0.01 to 65 wt%; more preferably, 1 to 50 wt%; preferably, 5 to 25 wt%), based on weight of the skin care formulation, of a color ingredient; wherein the color ingredient is selected from the group consisting of Ext. D&C Yellow No. 2, Ext. D & C Violet No. 2, FD&C Red No. 4, FD&C Red No. 40, FD&C Yellow No. 5, FD&C Yellow No. 6, FD&C Green No. 3, FD&C Blue No. 1, D&C Yellow No. 7, D&C Yellow No. 8, D&C Yellow No. 10, D&C Yellow No. 11, D&C Violet No. 2, D&C Red No. 6, D&C Red No. 7, D&C Red No. 17, D&C Red No. 21, D&C Red No. 22, D&C Red No. 27, D&C Red

No. 28, D&C Red No. 30, D&C Red No. 31, D&C Red No. 34, D&C Red No. 33, D&C Red No. 36, D&C Green No. 5, D&C Green No. 6, D&C Green No. 8, D&C Blue No. 4, D&C Orange No. 4, D&C Orange No. 5, D&C Orange No. 10, D&C Orange No. 11, D&C Brown No. 1, Aluminum powder, Annatto, Bismuth citrate, Bismuth Oxochloride, Bronze powder, Caramel, Carmine, β -Carotene, Chromium hydroxide green, Chromium oxide green, Copper chlorophyllin, Copper powder, Dihydroxyacetone, Ferric Ammonium ferrocyanide, Ferric ferrocyanide, Guanine, Iron oxide, Manganese Violet, Mica, Silver, Titanium Dioxide, Ultramarine, Zinc Oxide and mixtures thereof. Still more preferably, the skin care formulation of the present invention comprises 0 to 90 wt% (preferably, 0.01 to 65 wt%; more preferably, 1 to 50 wt%; preferably, 5 to 25 wt%), based on weight of the skin care formulation, of a color ingredient; wherein the color ingredient includes at least one iron oxide. Most preferably, preferably, the skin care formulation of the present invention comprises 0 to 90 wt% (preferably, 0.01 to 65 wt%; more preferably, 1 to 50 wt%; preferably, 5 to 25 wt%), based on weight of the skin care formulation, of a color ingredient; wherein the color ingredient includes a mixture of iron oxides.

[0022] Preferably, the color cosmetic formulation of the present invention, comprises 0 to 70 wt% (more preferably, 0.1 to 65 wt%; still more preferably, 5 to 60 wt%; most preferably, 10 to 25 wt%), based on weight of the skin care formulation, of a sun care active. More preferably, the skin care formulation of the present invention comprises 0 to 70 wt% (more preferably, 0.1 to 65 wt%; still more preferably, 5 to 60 wt%; most preferably, 10 to 25 wt%), based on weight of the skin care formulation, of a sun care active; wherein the sun care active is a UV radiation absorbing agent. Still more preferably, the skin care formulation of the present invention, comprises 0 to 70 wt% (more preferably, 0.1 to 65 wt%; still more preferably, 5 to 60 wt%; most preferably, 10 to 25 wt%), based on weight of the skin care formulation, of a sun care active; wherein the sun care active is a UV radiation absorbing agent selected from the group consisting of physical blockers (e.g., red petrolatum, titanium dioxide, zinc oxide); chemical absorbers (e.g.,

1-(4-methoxyphenol)-3-(4-tert-butylphenyl)propane-1,3-dione (INCI: Butyl Methoxydibenzoylmethane); 2-hydroxy-4-methoxybenzophenone (INCI: Benzophenone-3); dioxybenzone; sulisobenzone; menthyl anthranilate; para-aminobenzoic acid; amyl paradimethylaminobenzoic acid; octyl para-dimethylaminobenzoate; ethyl 4-bis (hydroxypropyl) para-aminobenzoate; polyethylene glycol (PEG-25) para-aminobenzoate; ethyl 4-bis (hydroxypropyl) aminobenzoate; diethanolamine para-methoxycinnamate; 2-ethoxyethyl para-methoxycinnamate; ethylhexyl para-methoxycinnamate; octyl para-

methoxycinnamate; isoamyl para-methoxycinnamate; 2-ethylhexyl-2-cyano-3,3-diphenyl-acrylate; 2-ethylhexyl-2-cyano-3,3-diphenyl-2-propenoate (INCI: octocrylene); 2-ethylhexyl-2-hydroxybenzoate (INCI: Ethylhexyl Salicylate); homomenthyl salicylate; glyceryl aminobenzoate; triethanolamine salicylate; digalloyl trioleate; lawsone with dihydroxyacetone; 2-phenylbenzimidazole-5-sulfonic acid; 4-methylbenzylidene camphor; avobenzone; triazines; benzotriazoles; vinyl group-containing amides; cinnamic acid amides; sulfonated benzimidazoles); 3,3,5-trimethylcyclohexyl 2-hydroxybenzoate (INCI: Homosalate)); and mixtures thereof. Yet more preferably, the skin care formulation of the present invention, comprises 0 to 70 wt% (more preferably, 0.1 to 65 wt%; still more preferably, 5 to 60 wt%; most preferably, 10 to 25 wt%), based on weight of the skin care formulation, of a sun care active; wherein the suncare active is a UV radiation absorbing agent comprises a mixture of UV radiation absorbing agents. Most preferably, the skin care formulation of the present invention, comprises 0 to 70 wt% (more preferably, 0.1 to 65 wt%; still more preferably, 5 to 60 wt%; most preferably, 10 to 25 wt%), based on weight of the skin care formulation, of a sun care active; wherein the suncare active is a UV radiation absorbing agent is a mixture of UV absorbing agents including at least one of titanium dioxide; 1-(4-methoxyphenol)-3-(4-tert-butylphenyl)propane-1,3-dione; 2-ethylhexyl-2-hydroxybenzoate; 2-ethylhexyl-2-cyano-3,3-diphenyl-2-propenoate; 2-hydroxy-4-methoxybenzophenone and 3,3,5-trimethylcyclohexyl 2-hydroxybenzoate.

[0023] Preferably, the skin care formulation of the present invention, optionally, further comprises an additive. More preferably, the skin care formulation of the present invention, further comprises an additive, wherein the additive is selected from the group consisting of water proofing agents, emollients, preservatives, antioxidants, fragrances, humectants, rheology modifiers, aesthetic modifiers, vitamins, skin protectants, oils, emulsifiers, surfactants, pearlizers, consistency factors, thickeners, super fatting agents, stabilizers, polymers, silicone compounds, fats, waxes, lecithins, phospholipids, fillers, light management powders, antiperspirant actives (e.g., aluminum salts, zirconium salts) and mixtures thereof.

[0024] Preferably, the skin care formulation of the present invention has a pH of 4 to 9. More preferably, the skin care formulation of the present invention has a pH of 4.5 to 8.5. Still more preferably, the skin care formulation of the present invention has a pH of 5.0 to 8.0. Most preferably, the skin care formulation of the present invention has a pH of 5.5 to 7.5.

[0025] Some embodiments of the present invention will now be described in detail in the following **Examples**.

Synthesis S1: Silylated Maltodextrin

[0026] Ammonium chloride (412.4 mg, 0.05 eq) and Glucidex[®] 1 maltodextrin (DE 1 from Roquette) (25.0 g, 0.154 mol, 1.0 eq) were combined in a 2 CV Helicone mixer (CIT) with a stirring speed at 5 Hz. The resulting mixture was transferred to a reactor.

Hexamethyldisilazane (80.87 g, 3.25 eq) was then added to the reactor contents dropwise. Dimethyl sulfoxide (10.8 g) was then added to the reactor contents. The reactor was then sealed and continuously flushed with nitrogen. The reactor contents were stirred at 20 Hz. Heat was applied to the reactor using a heating mantle set to a temperature of 40 °C and the stirring was increased to 50 Hz. After 30 min, the heating mantle was set to 50 °C. The temperature setting for the heating mantle was then increased to 80 °C over the course of 1 h by 10 °C increments. The reactor contents were stirred for 1 hr after the temperature of the reactor contents reached 71 °C. The heating mantle was then removed and the stirring was decreased to 25 Hz. When the reactor contents cooled to < 50 °C, stirring was stopped and 400 mL of ethyl acetate was added to the reactor contents. Stirring was then resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to a collection jar. Ethyl acetate (100 mL) was then added to the reactor contents and stirring was resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to the contents of the collection jar. The contents of the collection jar was transferred to a separatory funnel and washed with distilled water two times (2 x 250 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a fine white powder (~46.3 g). The degree of substitution, DS, of the -Si(CH₃)₃ on the maltodextrin base polymer was determined by ¹H NMR to be 1.67.

Synthesis S2: Silylated Maltodextrin

[0027] Ammonium chloride (454.4 mg, 0.05 eq) and Glucidex[®] 1 maltodextrin (DE 1 from Roquette) (27.0 g, 0.166 mol, 1.0 eq) were combined in a 2 CV Helicone mixer (CIT) with a stirring speed at 5 Hz. The resulting mixture was transferred to a reactor.

Hexamethyldisilazane (87.34 g, 3.25 eq) was then added to the reactor contents dropwise. Dimethyl sulfoxide (11.66 g) was then added to the reactor contents. The reactor was then sealed and continuously flushed with nitrogen. The reactor contents were stirred at 20 Hz. Heat was applied to the reactor using a heating mantle set to a temperature of 92 °C and the stirring was increased to 50 Hz. The reactor contents were stirred for 1.5 hr after the

temperature of the reactor contents reached 83 °C. The heating mantle was then removed and the stirring was decreased to 25 Hz. When the reactor contents cooled to < 50 °C, stirring was stopped and 400 mL of ethyl acetate was added to the reactor contents. Stirring was then resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to a collection jar. Ethyl acetate (100 mL) was then added to the reactor contents and stirring was resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to the contents of the collection jar. The contents of the collection jar was transferred to a separatory funnel and washed with distilled water two times (2 x 250 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a fine white powder (~56.6 g). The degree of substitution, DS, of the -Si(CH₃)₃ on the maltodextrin base polymer was determined by ¹H NMR to be 2.1.

Synthesis S3: Silylated Maltodextrin

[0028] Ammonium chloride (445.4 mg, 0.05 eq) and Glucidex[®] 1 maltodextrin (DE 1 from Roquette) (27.0 g, 0.167 mol, 1.0 eq) were combined in a 2 CV Helicone mixer (CIT) with a stirring speed at 5 Hz. The resulting mixture was transferred to a reactor. Hexamethyldisilazane (60.47 g, 2.25 eq) was then added to the reactor contents dropwise. Dimethyl sulfoxide (11.7 g) was then added to the reactor contents. The reactor was then sealed and continuously flushed with nitrogen. The reactor contents were stirred at 20 Hz. Heat was applied to the reactor using a heating mantle set to a temperature of 55 °C and the stirring was increased to 50 Hz. After 5 min, the heating mantle was set to 102 °C. The reactor contents were stirred for 2 hr. The heating mantle was then removed and the stirring was decreased to 25 Hz. When the reactor contents cooled to < 50 °C, stirring was stopped and 400 mL of ethyl acetate was added to the reactor contents. Stirring was then resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to a collection jar. Ethyl acetate (100 mL) was then added to the reactor contents and stirring was resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to the contents of the collection jar. The contents of the collection jar was transferred to a separatory funnel and washed with distilled water two times (2 x 250 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a fine white powder (~407.3 g). The degree of substitution, DS, of the -Si(CH₃)₃ on the maltodextrin base polymer was determined by ¹H NMR to be 2.55.

Synthesis S4: Silylated Maltodextrin

[0029] To a 25 mL scintillation vial was added ammonium chloride (33.0 mg, 0.05 eq) and Maltrin M250 maltodextrin (DE 23-27 from Grain Processing Corporation) (2.0 g, 12.3 mM, 1.0 eq). Hexamethyldisilazane (4.48 g, 2.25 eq) was then added dropwise to the vial contents. Dimethyl sulfoxide (1 g) was then added to the vial contents, and the vial was capped with a screw cap septum topped with two vent needles. The vial was placed on an aluminum heating block set at 85 °C for 1.5 hrs. The vial contents were then cooled down to < 50 °C and diluted with ethyl acetate (150 mL). The organic layer was transferred to a separatory funnel and washed with distilled water three times (3 x 50 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a fine white powder (~4.15 g). The degree of substitution, DS, of the -Si(CH₃)₃ on the maltodextrin base polymer was determined by ¹H NMR to be 2.2.

Synthesis S5: Silylated Cellulose

[0030] Polysaccharide (BioFloc XV, 15.0 g, from Tartas) was weighed in a 2 L three-neck flask equipped with a nitrogen inlet and a temperature controller. Solvent (N,N dimethylacetamide, 331 g, from Sigma-Aldrich) was added and the reaction mixture was placed under an atmosphere of nitrogen with an outlet to avoid over-pressurization of the reactor. Silane (hexamethyldisilazane, 30 g, from The Dow Chemical Company) was added at once to the reaction mixture. The mixture was slowly heated to a set temperature of 130 °C and stirred for 7.5 h. The solution was cooled naturally, then xylenes (600 g, from Sigma-Aldrich) was added to the reaction mixture along with additional hexamethyldisilazane (20 g) and the mixture was stirred for 4 h with a set temperature of 125 °C. The reactor contents were left to cool down to room temperature overnight. The reactor contents were then transferred to a separatory funnel and subjected to non-solvent precipitation by dropwise addition into 2 L of vigorously stirring methanol. The product was isolated by filtration, and dried in a vacuum oven at 50 °C overnight. The product was then suspended in 500 ml of methanol, then filtered and dried in a vacuum oven at 50 °C overnight. The product was analyzed by attenuated total reflection infrared to determine DS at 2.23.

Synthesis S6: Silylated Cellulose

[0031] Polysaccharide (E-60, 15.2 g, from GP Cellulose) was weighed in a 2 L three-neck flask equipped with a nitrogen inlet and a temperature controller. Solvent (N,N dimethylacetamide, 324 g) was added and the reaction mixture was placed under an atmosphere of nitrogen with an outlet to avoid over-pressurization of the reactor. Silane

(hexamethyldisilazane, 50.2 g, from The Dow Chemical Company) was added at once to the reaction mixture, along with the saccharin catalyst (850 mg, from Sigma-Aldrich). The mixture was slowly heated to a set temperature of 130 °C and stirred for 5 h. The solution was cooled naturally, then xylenes (400 g) were added to the reaction mixture and the mixture was stirred at 120 °C for 8 hours. The reactor contents were left to cool down to room temperature overnight. The cooled reactor contents were then transferred to a separatory funnel and subjected to non-solvent precipitation by dropwise addition into 2 L of vigorously stirring methanol. The product was isolated by filtration and dried in a vacuum oven at 50 °C overnight. The product was then suspended in 500 ml of methanol, then filtered again, and dried in a vacuum oven at 50 °C overnight. was analyzed by attenuated total reflection infrared to determine DS at 2.6.

Synthesis S7: Silylated Maltodextrin

[0032] To a 25 mL scintillation vial was added ammonium chloride (33.0 mg, 0.05 eq) and Maltrin M200 maltodextrin (DE range 16.5-19.9 from Grain Processing Corporation)(2.0 g, 12.3 mM, 1.0 eq). Hexamethyldisilazane (3.58 g, 1.80 eq) was then added dropwise to the vial contents. Dimethyl sulfoxide (0.75 g) was then added to the vial contents and the vial was outfitted with a septum cap with two vent needles. The vial was placed on a heating block set at 80 °C for 1 hr. The vial contents were then cooled down to < 50 °C and diluted with ethyl acetate (150 mL). The organic layer was transferred to a separatory funnel and washed with distilled water three times (3 x 50 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a fine white powder (~3.6 g). The degree of substitution, DS, of the -Si(CH₃)₃ on the maltodextrin base polymer was determined by ¹H NMR to be 2.76.

Synthesis S8: Silylated Maltodextrin

[0033] To a 25 mL scintillation vial was added ammonium chloride (33.0 mg, 0.05 eq) and Maltrin M040 (DE 4-7 from Grain Processing Corporation) (2.0 g, 12.3 mM, 1.0 eq). Hexamethyldisilazane (4.48 g, 2.25 eq) was then added dropwise to the vial contents. Dimethyl sulfoxide (1 g) was then added to the vial contents and the vial was outfitted with a septum cap with two vent needles. The vial was placed on a heating block set at 85 °C for 1.5 hrs. The vial contents were then cooled down to < 50 °C and diluted with ethyl acetate (150 mL). The organic layer was transferred to a separatory funnel and washed with distilled water three times (3 x 50 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a

fine white powder (~4.15 g). The degree of substitution, DS, of the $-\text{Si}(\text{CH}_3)_3$ on the maltodextrin base polymer was determined by ^1H NMR to be 2.5.

Synthesis S9: Silylated Maltodextrin

[0034] Ammonium chloride (445.4 mg, 0.05 eq) and Glucidex[®] 1 maltodextrin (DE 1 from Roquette) (27.0 g, 0.166 mol, 1.0 eq) were combined in a 2 CV Helicone mixer (CIT) with a stirring speed at 5 Hz. The resulting mixture was transferred to a reactor.

Hexamethyldisilazane (87.34 g, 3.25 eq) was then added to the reactor contents dropwise. Dimethyl sulfoxide (11.66 g) was then added to the reactor contents. The reactor was then sealed and continuously flushed with nitrogen. The reactor contents were stirred at 20 Hz. Heat was applied to the reactor using a heating mantle set to a temperature of 50 °C and the stirring was increased to 50 Hz. After 20 min, the heating mantle was set to 100 °C. The reactor contents were stirred for 2 hrs. The heating mantle was then removed and the stirring was decreased to 25 Hz. When the reactor contents cooled to < 50 °C, stirring was stopped and 400 mL of ethyl acetate was added to the reactor contents. Stirring was then resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to a collection jar. Ethyl acetate (100 mL) was then added to the reactor contents and stirring was resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to the contents of the collection jar. The contents of the collection jar was transferred to a separatory funnel and washed with distilled water two times (2 x 250 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a fine white powder (~53 g). The degree of substitution, DS, of the $-\text{Si}(\text{CH}_3)_3$ on the maltodextrin base polymer was determined by ^1H NMR to be 2.23.

Synthesis S10: Silylated Maltodextrin

[0035] To a 25 mL scintillation vial was added ammonium chloride (33.0 mg, 0.05 eq) and Glucidex[®] 1 maltodextrin (DE 1 from Roquette) (2.0 g, 12.3 mM, 1.0 eq). Hexamethyldisilazane (4.48 g, 2.25 eq) was then added dropwise to the vial contents. Dimethyl sulfoxide (1 g) was then added to the vial contents and the vial was outfitted with a septum cap with two vent needles. The vial was placed on a heating block set at 85 °C for 2 hrs. The vial contents were then cooled down to < 50 °C and diluted with ethyl acetate (150 mL). The organic layer was transferred to a separatory funnel and washed with distilled water three times (3 x 50 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a

fine white powder (~3.96 g). The degree of substitution, DS, of the $-\text{Si}(\text{CH}_3)_3$ on the maltodextrin base polymer was determined by ^1H NMR to be 2.51.

Synthesis S11: Silylated Maltodextrin

[0036] Ammonium chloride (445.4 mg, 0.05 eq) and Glucidex[®] 1 maltodextrin (DE 1 from Roquette) (27.0 g, 0.166 mol, 1.0 eq) were combined in a 2 CV Helicone mixer (CIT) with a stirring speed at 5 Hz. The resulting mixture was transferred to a reactor.

Hexamethyldisilazane (87.34 g, 3.25 eq) was then added to the reactor contents dropwise. Dimethyl sulfoxide (11.66 g) was then added to the reactor contents. The reactor was then sealed and continuously flushed with nitrogen. The reactor contents were stirred at 20 Hz. Heat was applied to the reactor using a heating mantle set to a temperature of 50 °C and the stirring was increased to 50 Hz. After 20 min, the heating mantle was set to 100 °C. The reactor contents were stirred for 2 hrs. The heating mantle was then removed and the stirring was decreased to 25 Hz. When the reactor contents cooled to < 50 °C, stirring was stopped and 400 mL of ethyl acetate was added to the reactor contents. Stirring was then resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to a collection jar. Ethyl acetate (100 mL) was then added to the reactor contents and stirring was resumed at 25 Hz for 5 min. Stirring was then stopped and the organic layer was transferred to the contents of the collection jar. The contents of the collection jar was transferred to a separatory funnel and washed with distilled water two times (2 x 250 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield a fine white powder (~56.3 g). The degree of substitution, DS, of the $-\text{Si}(\text{CH}_3)_3$ on the maltodextrin base polymer was determined by ^1H NMR to be 2.42.

Synthesis S12: Silylated Maltodextrin

[0037] To a 25 mL scintillation vial was added ammonium chloride (24.7 mg, 0.05 eq) and dried Glucidex[®] 1 maltodextrin (DE 1 from Roquette) (1.5 g, 3.25 eq). Hexamethyldisilazane (4.85 g, 3.25 eq) was then added dropwise to the vial contents. Dimethyl sulfoxide (0.8 g) was then added to the vial contents and the vial was outfitted with a septum cap with two vent needles. The vial was placed on a heating block set at 90 °C for 4 hrs. The vial contents were then cooled down to < 50 °C and diluted with ethyl acetate (200 mL). The organic layer was transferred to a separatory funnel and washed with a 50/50 vol/vol mixture of brine and distilled water three times (3 x 60 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield an off white crystalline solid, that was easily reduced to a

fine powder with a spatula. The product powder was dried under vacuum in an oven at 50 °C for 5 hrs. The degree of substitution, DS, of the $-\text{Si}(\text{CH}_3)_3$ on the maltodextrin base polymer was determined by ^1H NMR to be 2.42.

Synthesis S13: Silylated Maltodextrin

[0038] To a 25 mL scintillation vial was added ammonium chloride (24.7 mg, 0.05 eq) and dried Maltrin M150 maltodextrin (DE 13-17 from Grain Processing Corporation)(1.5 g, 1.0 eq). Hexamethyldisilazane (4.85 g, 3.25 eq) was then added dropwise to the vial contents. Dimethyl sulfoxide (0.8 g) was then added to the vial contents and the vial was outfitted with a septum cap with two vent needles. The vial was placed on a heating block set at 90 °C for 2.5 hrs. The vial contents were then cooled down to < 50 °C and diluted with ethyl acetate (200 mL). The organic layer was transferred to a separatory funnel and washed with a 50/50 vol/vol mixture of brine and distilled water three times (3 x 60 mL). The organic layer was collected in an Erlenmeyer flask, and dried with sodium sulfate. The organic layer was then concentrated under vacuum to yield an off white crystalline solid, that was easily reduced to a fine powder with a spatula. The product powder was dried under vacuum in an oven at 50 °C for 5 hrs. The degree of substitution, DS, of the $-\text{Si}(\text{CH}_3)_3$ on the maltodextrin base polymer was determined by ^1H NMR to be 2.64.

Solubility screening (2 wt%)

[0039] The solubility of the products of **Syntheses S1-S6** and a commercial maltodextrin with a DE of 1 (Glucidex[®] 1 from Roquette) were assessed in different carriers by combining individually in separate vials the products of **Syntheses S1-S6** (0.1 g) and the commercial maltodextrin with various solvents (4.9 g) as noted in **TABLE 1**. The resulting 2 wt% solutions were stirred with a magnetic stir bar for 1 hour at ~22 °C. The carriers and solubility observations are provided in **TABLE 1**.

TABLE 1

Carrier	Observation						
	Solute (2 wt%) in carrier						
	S1	S2	S3	S4	S5	S6	Malt⁹
Water	I	I	I	I	I	I	S
Ethanol	I	S	S	S	I	I	I
Dimethicone, 2 cSt ¹	--	S	S	S	I	S*	I
Isododecane	I	S	S	S	I	I	I
Isohexadecane	--	S	S	--	--	--	--
Methyl undecanoate	--	S	S	S	--	--	--
Triglycerides ²	--	S	S	S	--	--	--
Dicaprylyl carbonate ³	--	S	S	S	--	--	--
C ₁₂₋₁₅ alkyl benzoate ⁴	--	S	S	S	I	I	I
C ₁₃₋₁₅ Alkane ⁵	--	S	S	S	--	--	--
Dioctylether	--	S	S	S	--	--	--
Ethyl PG-Acetal Levulinate ⁶	--	S	S	--	--	--	--
Homosalates ⁷	--	S	S	S	--	--	--
Sunflower oil ⁸	--	I	I	S*	I	I	I

¹ DOWSIL™ 200 fluid (2 cSt) from The Dow Chemical Company
² CRODAMOL™ GTCC from Croda
³ CETIOL® CC from BASF
⁴ CRODAMOL™ ABLQ from Croda
⁵ NEOSSANCE® hemisqualane from Centerchem
⁶ ECOSMOOTH™ universal fluid 1100 from The Dow Chemical Company
⁷ PARSOL® HMS from DSM
⁸ Sunflower oil, USDA Certified Organic from MakingCosmetics
⁹ Glucidex® 1 maltodextran with DE 1 from Roquette.
^S Soluble and clear
^{S*} Soluble and slightly hazy
^I Insoluble

Solubility screening (50 wt%)

[0040] The solubility of the products of **Syntheses S2-S3** and **S7** (2 g) were assessed in isododecane (2 g) as noted in **TABLE 2**. The resulting 50 wt% solutions were stirred with a magnetic stir bar for 1 hour at ~22 °C. The carriers and solubility observations are provided in **TABLE 2**.

TABLE 2

Carrier	Observation		
	Solute (50 wt%) in carrier		
	S2	S3	S7
Isododecane	S	S	S
Ethanol	not tested	S	S

^S Soluble and clear

Viscosity in isododecane

[0041] The product of **Synthesis S5-S6** and **S9** was dissolved in isododecane at different concentrations in as noted in **TABLE 3**. The viscosity of the resulting solutions were then determined using a Brookfield DV-111-ultra viscometer, equipped with a SC4-28 spindle at ~ 22 °C and 100 rpm. The results are provided in **TABLE 3**.

TABLE 3

Solute	Concentration (wt%)	Viscosity (cP)
Synthesis S5	2	3,500
Synthesis S6	2	3,200
Synthesis S6	5	gel
Synthesis S9	2	0
Synthesis S9	5	2
Synthesis S9	20	5
Synthesis S9	40	305
Synthesis S9	50	1,260

Comparative Examples CF1-CF2 and Examples F1-F4: Pigmented dispersions

[0042] Pigmented dispersions were prepared in **Comparative Examples CF1-CF2** and **Examples F1-F4** by mixing Red Iron Oxide (CI 77491) (and) Triethoxycaprylylsilane pigment (1 g) from Gelest, a carrier (9.8 g) with ingredient (0.2 g) noted in **TABLE 4**.

TABLE 4

Example	Carrier	Ingredient
Comp. Ex. CF1	Isododecane	None
Comp. Ex. CF2	Isododecane	Synthesis S7
Example F1	Isododecane	Synthesis S8
Example F2	Isododecane	Synthesis S9
Example F3	Isododecane	Synthesis S3
Example F4	Isododecane	Synthesis S10

Rub off resistance

[0043] Films were deposited from the dispersions prepared according to **Comparative Examples CF1-CF2** and **Examples F1-F4** by coating on Vitro-skin (from IMS inc.) at 50 µm (wet thickness) using an automatic coater and a rectangular applicator. The deposited films were air dried in an environmental controlled room (~22 °C and 50% RH) overnight. The collagen was punched and adhered to an XRF cylindrical holder using double sided tape. Initial L, a, b values were measured using a color spectrophotometer from BYK-Gardner (Germany). The ΔE values for the films were calculated from the measured L, a and b values. The XRF cylinder was then placed on a felt band (thickener/film coating touching the band) and run through using a washability tester (Braive Instruments S.A., Belgium). The felt band was changed between each rub-off cycle. The results of the rub-off tests are

provided in TABLE 5. The rub-off resistance (aka wear resistance) is directly related to the ΔE over rub off cycle. The lower the ΔE , the better the resistance to wear.

TABLE 5

Film of Example	Carrier	DE	DS	ΔE (at 50 cycles)	
Comp. Ex. CF1	Isododecane	--	--	26.5	
Comp. Ex. CF2	Isododecane	16.9-19.9	2.76	3.01	
Example F1	Isododecane	4-7	2.5	2.10	
Example F2	Isododecane	1	2.2	2.73	
Example F3	Isododecane	1	2.55	2.10	
Example F4	Isododecane	1	2.51	2.0	

Comparative Examples CF3-CF5 and Examples F5-F9: Water Repellency

[0044] Water repellency of a film is strongly influenced by surface energy. High water repellency is desirable for skin care applications. The water repellency of a formulation can be evaluated by measuring the water contact angle from a deposited film of the formulation. Specifically, films were coated onto a glass slide (50 μm) from dispersions formed using the ingredients noted in TABLE 6 using a doctor blade film applicator with the gap set at 6 mils (0.1524 mm) from the as received polymer solutions, and films were air dried in an environmental controlled room (~22 °C and 50% RH) for at least 72 hours. The water contact angles for the deposited films were then measured (in degrees) at 4 and 120 seconds after water droplets were deposited on the substrate using a drop shape analyzer (Kruss DSA100). The results of the water contact angle measurements are provided in TABLE 6. Higher contact angles indicate greater water repellency. Contact angles of above 90° are considered excellent.

TABLE 6

Example	Ingredients			Water contact angle (°)	
	Polymer Type	Isododecane		4 s	120 s
		(wt%)	(wt%)		
Comp. Ex. CF3	Silicone Acrylate ¹	2	98	104.5	102.3
Comp. Ex. CF4	Modified pullulan ²	2	98	92.4	90.7
Comp. Ex. CF5	Ethyl cellulose ³	2	98	71.3	66.3
Example F4	Synthesis S11	2	98	96.2	94.2
Example F6	Synthesis S12	2	98	108.0	93.8
Example F7	Synthesis S13	2	98	106.1	101.5
Example F8	Synthesis S3	2	98	129.4	114.4
Example F9	Synthesis S3	20	80	112.6	100.2

¹ DOWSIL™ FA4012 ID acrylates/polytrimethylsiloxy-methacrylate copolymer from The Dow Chemical Company
² TSPL-30-ID isododecane (and) trimethylsiloxyethylcarbamoyl pullan from Shin-Etsu Chemical Co., Ltd.
³ ETHOCEL™ 7 from DuPont

Comparative Examples CF6-CF9 and Examples F10-F12: Color cosmetic formulations

[0045] Color cosmetic formulations were prepared in **Comparative Examples CF6-CF9** and **Examples F10-F12** having the formulation noted in **TABLE 7**. The Phase A and Phase B ingredients were mixed in a separate container. The Phase B and Phase C ingredients were combined in a separate beaker and mixed until uniform. The mixed Phase B and C ingredients were then added to the combined Phase A ingredients and mixed until homogeneous.

TABLE 7

Phase	Ingredient INCI name	Example						
		CF6	CF7	CF8	CF9	F10	F11	F12
		wt%						
A	PEG-10 Dimeticone ¹	5	5	5	5	5	5	5
A	Isododecane	18.7	18.2	17.7	16.2	13.7	17.7	16.2
A	Silica ²	2	2	2	2	2	2	2
A	Silica silylate ³	0.3	0.3	0.3	0.3	0.3	0.3	0.3
A	Silicone elastomer blend ⁴	6	6	6	6	6	6	6
A	Product Synthesis S9	--	--	--	--	5	1	2.5
A	Product Synthesis S6	--	0.5	1	2.5	--	--	--
A	Isododecane (and) disteardimonium hectorite ⁵	6	6	6	6	6	6	6
B	Deionized water	42	42	42	42	42	42	42
B	Butylene glycol	3	3	3	3	3	3	3
B	Phenoxyethanol ⁶	0.5	0.5	0.5	0.5	0.5	0.5	0.5
B	Sodium chloride	1	1	1	1	1	1	1
C	Titanium dioxide ⁷	15.5	15.5	15.5	15.5	15.5	15.5	15.5

¹ DOWSIL™ ES-5612 formulation aid from The Dow Chemical Company
² Spheron P-1500 silica micro bead from Presperse
³ DOWSIL™ VM-2270 aerogel fine particles from The Dow Chemical Company
⁴ DOWSIL™ EL-TIPS silicone elastomer blend from The Dow Chemical Company
⁵ Bentone ISD from Elementis Global
⁶ Neolone PH 100 from DuPont
⁷ ACT96-TRI-77891 from Miyoshi America

Rub off resistance

[0046] Films were deposited from the color cosmetic formulations prepared according to **Comparative Example CF6** and **Example F10** by coating on Vitro-skin (from IMS inc.) at 25 μm (wet thickness) using an automatic coater and a rectangular applicator. The deposited films were air dried in an environmental controlled room (~22 °C and 50% RH) overnight. The felt was punched and adhered to an XRF cylindrical holder using double sided tape. Initial L, a, b values were measured using a color spectrophotometer from BYK-Gardner (Germany). The ΔE values for the films were calculated from the measured L, a and b values. The XRF cylinder was then placed on a felt band (thickener/film coating touching the

band) and run through using a washability tester (Braive Instruments S.A., Belgium). The felt band was changed between each rub-off cycle. The results of the rub-off tests are provided in **TABLE 8**. The rub off resistance (aka wear resistance) is directly related to the ΔE over rub off cycle. The lower the ΔE , the better the resistance to wear.

TABLE 8

Film of Example	ΔE after 50 cycles
Comp. Example CF6	17
Example F10	4

Formulation Stability

[0047] The storage stability of the color cosmetic formulations prepared according to **Comparative Examples CF7-CF9** and **Examples F10-F12** were evaluated after six months of storage at room temperature (21 °C) and at 40 °C. The results are provided in **TABLE 9**.

TABLE 9

Formulation	Stable after six months	
	at 21°C	at 40 °C
Comp. Example CF7	yes	yes
Comp. Example CF8	yes	no
Comp. Example CF9	no	no
Example F10	yes	yes
Example F11	yes	yes
Example F12	yes	yes

Comparative Example CF10-CF12 and Example F13: Dispersions

[0048] Dispersions were prepared in **Comparative Examples CF10-CF12** and **Example F13** by mixing isododecane (9.8 g) with ingredient (0.2 g) noted in **TABLE 10**.

TABLE 10

Example	Ingredient
Comp. Ex. CF10	Isododecane (and) Acrylates/Polytrimethylsiloxymethacrylate Copolymer ¹
Comp. Ex. CF11	Isododecane (and) Trimethylsiloxysilylcarbamoyl pullan ²
Comp. Ex. CF12	Ethylcellulose ³
Example F13	product of Synthesis S2

¹ DOWSIL™ FA4012 ID silicone acrylate from The Dow Chemical Company
² TSPL-30-ID from Shin-Etsu Chemical Co., Ltd.
³ ETHOCEL™ 7 from DuPont

Water Repellency

[0049] Water repellency of a film is strongly influenced by surface energy. High water repellency is desirable for color cosmetic applications. The water repellency of a formulation can be evaluated by measuring the water contact angle from a deposited film of the formulation. Specifically, films were deposited from the dispersions prepared according to **Comparative Examples CF10-CF12** and **Example F13** on glass using a square film applicator with the gap set at 50 μm (wet thickness) from the as received polymer solutions,

and films were air dried in an oven (~32 °C and 50% RH) for at least 16 hours. The water contact angles were measured (in degrees) at approximately 4 seconds and at 115 seconds after water droplets were deposited on the substrate using a drop shape analyzer (Kruss DSA100). The results of the water contact angle measurements are provided in **TABLE 11**.

The contact angle retention reported in **TABLE 11** is according to the following formula:

$$\text{Retention (in \%)} = [(\text{Contact Angle at time}=115 \text{ sec.}) / (\text{Contact Angle at time}=4 \text{ sec.})] * 100$$

TABLE 11

Composition	Water Contact angle		
	time (in sec.)		Retent. (%)
	4	200	
Comp. Example CF10	104.5	102.3	97.9
Comp. Example CF11	92.4	90.7	98.1
Comp. Example CF12	71.3	66.3	93.0
Example F13	96.2	94.2	97.9

We claim:

1. A skin care formulation, comprising:
a film forming polymer, wherein the film forming polymer is a functionalized maltodextrin comprising a maltodextrin base polymer functionalized with $-\text{Si}(\text{R}^1)_3$ groups; wherein each R^1 is independently a C_{1-10} linear or branched, saturated alkyl group; wherein the maltodextrin base polymer has a dextrose equivalent, DE, of 1 to 24; wherein the functionalized maltodextrin has a degree of substitution of $-\text{Si}(\text{R}^1)_3$ groups, DS, of 1.7 to 3; and wherein the functionalized maltodextrin is free of vinylic carbon.
2. The skin care formulation of claim 1, further comprising a dermatologically acceptable carrier.
3. The skin care formulation of claim 2, wherein the dermatologically acceptable carrier is selected from the group consisting of water; glycols; C_{1-10} straight or branched chain alcohols; ketones; acetates; butyl cellusolve; dimethicones; polydimethylsiloxanes; alkanes; alkanoates, dermatologically acceptable hydrophobic ester oils; dicaprylyl carbonate; alkyl benzoates; hemisqualane; dioctylether; keto acids and mixtures thereof.
4. The skin care formulation of claim 3, further comprising a color ingredient.
5. The skin care formulation of claim 4, wherein the color ingredient is selected from the group consisting of inorganic pigments, organic pigments, aqueous pigment dispersions and mixtures thereof.
6. The color cosmetic formulation of claim 4, wherein the color ingredient is selected from the group consisting of Ext. D&C Yellow No. 2, Ext. D & C Violet No. 2, FD&C Red No. 4, FD&C Red No. 40, FD&C Yellow No. 5, FD&C Yellow No. 6, FD&C Green No. 3, FD&C Blue No. 1, D&C Yellow No. 7, D&C Yellow No. 8, D&C Yellow No. 10, D&C Yellow No. 11, D&C Violet No. 2, D&C Red No. 6, D&C Red No. 7, D&C Red No. 17, D&C Red No. 21, D&C Red No. 22, D&C Red No. 27, D&C Red No. 28, D&C Red No. 30, D&C Red No. 31, D&C Red No. 34, D&C Red No. 33, D&C Red No. 36, D&C Green No. 5, D&C Green No. 6, D&C Green No. 8, D&C Blue No. 4, D&C Orange No. 4, D&C Orange No. 5, D&C Orange No. 10, D&C Orange No. 11, D&C Brown No. 1, Aluminum powder, Annatto, Bismuth citrate, Bismuth Oxychloride, Bronze powder, Caramel, Carmine, β -Carotene, Chromium hydroxide green, Chromium oxide green, Copper chlorophyllin, Copper powder, Dihydroxyacetone, Ferric Ammonium ferrocyanide, Ferric ferrocyanide, Guanine, Iron oxide, Manganese Violet, Mica, Silver, Titanium Dioxide, Ultramarine, Zinc Oxide and mixtures thereof.
7. The color cosmetic formulation of claim 4, wherein the color ingredient

includes at least one iron oxide.

8. The color cosmetic formulation of claim 7, wherein the dermatologically acceptable carrier includes isododecane.

9. The color cosmetic formulation of claim 4, further comprising a sunscreen active.

10. The color cosmetic formulation of claim 4, wherein the color cosmetic formulation has a pH of 5.5 to 7.5.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2023/076635

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/31 A61K8/73 A61Q1/02 C08B31/08
ADD.

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

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
A61K A61Q C08B

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE GNPDP [Online] MINTEL; 26 July 2022 (2022-07-26), anonymous: "Slim Mascara", XP093118959, Database accession no. 9768612 the whole document -----	1-10
A	DATABASE GNPDP [Online] MINTEL; 16 September 2022 (2022-09-16), anonymous: "Skincare Foundation SPF 27", XP093118958, Database accession no. 9914990 the whole document ----- -/--	1-10

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	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 12 January 2024	Date of mailing of the international search report 26/01/2024
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Donovan-Beermann, T
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INTERNATIONAL SEARCH REPORT

International application No PCT/US2023/076635
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>CHESTER THOMAS L. ET AL: "Determination of Maltodextrin in Psyllium-Based Bulk Laxatives by in Situ Silylation and Supercritical Fluid Chromatography", ANALYTICAL CHEMISTRY, vol. 67, no. 7, 1 April 1995 (1995-04-01), pages 1290-1292, XP093118839, US</p> <p>ISSN: 0003-2700, DOI: 10.1021/ac00103a022</p> <p>the whole document</p> <p style="text-align: center;">-----</p>	1-10