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(54) Title: STABLE, HIGH SALT CONTAINING SKIN CARE COMPOSITIONS

(57) Abstract: An oil in water emulsion that has a water phase and an oil phase. The water phase includes greater than about 0.5% of the salt form of a neutralized acid, the acid being preferably salicylic acid; and, from about 2% to about 0.001%, by weight of a gum. The oil in water emulsion is stable, that is, it is substantially unaltered in chemical state and physical homogeneity, upon exposure to 14 days at a temperature & humidity of about 50 °C and 60% RH. The gum is preferably xanthan gum, and the emulsion may include from about 0.01 to about 10%, of an emulsifier.

STABLE, HIGH SALT CONTAINING SKIN CARE COMPOSITIONS

FIELD OF THE INVENTION

The present invention relates to stable skin care compositions with high salt concentrations for use in improving the look and stability of skin care products.

BACKGROUND OF THE INVENTION

Skin care composition and methods of emulsifying them are known. But there is a continuing need for compositions that look and feel better and are more stable over time. This is especially critical when the skin care composition contains a high level of salt. The salts, for example neutralized salicylic acid, may have benefits in a skin care composition. The benefits may include protection of the skin from environmental attack.

But when an acid is neutralized and then added to an oil in water emulsion, the emulsion tends to become unstable and phase separate. Many known compositions such as fatty alcohols and polymers are believed to stabilize oil in water emulsions. But these have failed to stabilize oil in water emulsions with a high salt content. The instability of high salt containing emulsions remains an issue even when the water phase is thickened with commercially available thickeners. One skilled in the art might expect a thickened, high viscosity composition to be relatively stable to the addition of salts, but such is not the case.

Thus, when a new active ingredient or composition enhancer is developed, and it is in the form of a salt of a neutralized acid, there exists an ongoing need to find stability enhancers that allow these salts to be added into an oil in water emulsion.

SUMMARY OF THE INVENTION

The present invention relates to an oil in water emulsion comprising a water phase and an oil phase. The water phase comprises greater than about 0.5%, preferably greater than about 1.2%, even more preferably greater than about 1.5% of the salt form of a neutralized acid. The acid is preferably selected from the group consisting of salicylic acid, glycolic acid and combinations thereof. Preferably the salt is the neutralized form of salicylic acid. The water phase further comprises from about 2% to about 0.001%, preferably from about 1.5% to about 0.1%, even more preferably from about 1.0% to about 0.5%, by weight of a gum. The oil in water emulsion is stable, that is it is substantially unaltered in chemical state and physical homogeneity, upon exposure to 14 days at a temperature of about 50 °C. The gum is preferably xanthan gum and the oil in water emulsion may further comprise from about 0.01 to about 10%, of an emulsifier.

The present invention provides better stability over time than oil in water emulsions containing high levels of salt without the presence of gum.

DETAILED DESCRIPTION OF THE INVENTION

All percentages and ratios used herein are by weight of the total composition, unless otherwise designated. All measurements are understood to be made at ambient conditions, where "ambient conditions" means conditions at about 25 °C, under about one atmosphere of pressure, and at about 50% relative humidity, unless otherwise designated. All numeric ranges are inclusive of narrower ranges; delineated upper and lower range limits are combinable to create further ranges not explicitly delineated.

The compositions of the present invention can comprise, consist essentially of, or consist of, the essential components as well as optional ingredients described herein. As used herein, "consisting essentially of" means that the composition or component may include additional ingredients, but only if the additional ingredients do not materially alter the basic and novel characteristics of the claimed compositions or methods.

"Apply" or "application," as used in reference to a composition, means to apply or spread the compositions of the present invention onto keratinous tissue such as the epidermis.

"Keratinous tissue" refers to keratin-containing layers disposed as the outermost protective covering of mammals (*e.g.*, humans, dogs, cats, etc.) which includes, but is not limited to, skin, lips, hair, toenails, fingernails, cuticles, hooves, etc.

"Dermatologically acceptable" means that the compositions or components described are suitable for use in contact with human skin tissue without undue toxicity, incompatibility, instability, allergic response, and the like.

"Safe and effective amount" means an amount of a compound or composition sufficient to significantly induce a positive benefit.

"Stable" and "stability" refer to compositions which are substantially unaltered in chemical state, physical homogeneity and/or color, upon exposure to conditions reasonably expected to be incurred in shipping, storage and use, for example, for at least 30 days at a temperature of from about 0 °C to about 40 °C.

"Non-UV" means a material not recognized by a skilled artisan in the field of sunscreen formulation to be a dermatologically acceptable UV active absorbing material.

"UV active" means a material recognized by a skilled artisan in the field of sunscreen formulation to be a dermatologically acceptable UV active absorbing material. Such UV actives may be described as being UV-A and/or UV-B active agents. Approval by a regulatory agency is

generally required for inclusion of active agents in formulations intended for human use. Those active agents which have been or are currently (per 21 C.F.R. part 352) approved by the U.S. Food and Drug Administration as acceptable for use in over-the counter sunscreen drug products include organic and inorganic substances including, without limitation, para aminobenzoic acid, avobenzone, cinoxate, dioxybenzone, homosalate, menthyl anthranilate, octyl salicylate, oxybenzone, padimate O, phenylbenzimidazole sulfonic acid, sulisobenzone, trolamine salicylate, titanium dioxide, zinc oxide, diethanolamine methoxycinnamate, digalloy trioleate, ethyl dihydroxypropyl PABA, glyceryl aminobenzoate, lawsone with dihydroxyacetone, red petrolatum. Examples of additional sunscreen actives that have not yet been approved in the U.S. but are approved for over the counter use in other regions or countries such as Europe (per European Commission's Cosmetic Directive Regulation), Japan, China, Australia, New Zealand, or Canada include ethylhexyl triazone, dioctyl butamido triazone, benzylidene malonate polysiloxane, terephthalylidene dicamphor sulfonic acid, disodium phenyl dibenzimidazole tetrasulfonate, diethylamino hydroxybenzoyl hexyl benzoate, bis diethylamino hydroxybenzoyl benzoate, bis benzoxazoylphenyl ethylhexylimino triazine, drometrizole trisiloxane, methylene bis-benzotriazolyl tetramethylbutylphenol, and bis-ethylhexyloxyphenol methoxyphenyltriazine, 4-methylbenzylidenecamphor, and isopentyl 4-methoxycinnamate. However, as the list of approved materials is currently expanding, those of ordinary skill will recognize that the invention is not limited to UV actives currently approved for human use but are readily applicable to those that may be allowed in the future.

"Leave-on," in reference to compositions, means compositions intended to be applied to and allowed to remain on the keratinous tissue. These leave-on compositions are to be distinguished from compositions which are applied to the skin and subsequently (in a few minutes or less) removed either by washing, rinsing, wiping, or the like. Leave-on compositions exclude rinse-off applications such as shampoos, facial cleansers, hand cleansers, body wash, or body cleansers. The leave-on compositions may be substantially free of cleansing or detersive surfactants. For example, "leave-on compositions" may be left on the keratinous tissue for at least 15 minutes. For example, leave-on compositions may comprise less than 1% detersive surfactants, less than 0.5% detersive surfactants, or 0% detersive surfactants. The compositions may, however, contain emulsifying or other processing surfactants that are not intended to provide any significant cleansing benefits when applied topically to the skin.

"Derivatives" means an ester, ether, amide, hydroxy, and/or salt structural analogue of the relevant compound.

"Soluble" means at least about 0.1 g of solute dissolves in 100 ml of solvent, at 25 °C and 1 atm of pressure.

Stable Emulsions

Emulsion may be generally classified as having a continuous aqueous phase (*e.g.*, oil-in-water and water-in-oil-in-water) or a continuous oil phase (*e.g.*, water-in-oil and oil-in-water-in-oil). The present invention focuses on a continuous water phase emulsion, which has an aqueous based carrier. Suitable carriers include water and/or water miscible solvents. The present emulsions may comprise from about 1% to about 95 % by weight of water and/or water miscible solvent. The emulsions may comprise from about 1%, 3%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, or 85% to about 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10% , or 5% water and/or water miscible solvents. Suitable water miscible solvents include monohydric alcohols, dihydric alcohols, polyhydric alcohols, glycerol, glycols, polyalkylene glycols such as polyethylene glycol, and mixtures thereof. Particularly suitable solvents, include lower aliphatic alcohols such as ethanol, propanol, butanol, isopropanol; diols such as 1,2-propanediol,1,3-propanediol, butanediol, pentanediol, hexanediol, heptanediol, decanediol; glycerin; water, and mixtures thereof. In certain embodiments, the personal care composition comprises water, diols, glycerin, and combinations thereof. When the personal care product is in the form of an emulsion, water and/or water miscible solvents are carriers typically associated with the aqueous phase.

Suitable oil based carriers for the present emulsions may comprise from about 1% to about 95 % by weight of one or more oils. The composition may comprise from about 0.1%, 0.5%, 1%, 2%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, or 90% to about 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10%, 5%, or 3% of one or more oils. Oils may be used to solubilize, disperse, or carry materials that are not suitable for water or water soluble solvents. Suitable oils include silicones, hydrocarbons, esters, amides, ethers, and mixtures thereof. Oils may be fluid at room temperature. However, certain personal care product forms (*i.e.*, solid or semi-solid stick) may require non-fluid oils. The oils may be volatile or nonvolatile. "Non-volatile" means a material that exhibit a vapor pressure of no more than about 0.2 mm Hg at 25°C at one atmosphere and/or a material that has a boiling point at one atmosphere of at least about 300°C. "Volatile" means that the material exhibits a vapor pressure of at least about 0.2 mm. of mercury at 20° C. Volatile oils may be used to provide a lighter feel when a heavy,

greasy film is undesirable. When the personal care product is in the form of an emulsion, oils are carriers typically associated with the oil phase.

Each phase may generally be in the form of an emulsion with two or more domains (e.g., oil-in-water emulsion or a water-in-oil emulsion), an aqueous or oil gel, or aqueous and oil dispersion. A suitable multi-phase composition may comprise two or more phases wherein each phase has the same or different general form. Specifically, a multi-phase composition may comprise two or more phases wherein each phase is in the form of an emulsion having an aqueous continuous domain and a non-aqueous or oil domain. In one embodiment, the phase may have a viscosity of from about 75,000 to about 100,000 centipoise. Viscosities are measured on a Brookfield viscometer using a T-C bar spindle with a heliopath setting at 5 rpm at 25°C

Stabilizing Gums

"Gum" is a broadly defined term in the art. Gums include acacia, agar, algin, alginic acid, ammonium alginate, amylopectin, calcium alginate, calcium carrageenan, carnitine, carrageenan, dextrin, gelatin, gellan gum, guar gum, guar hydroxypropyltrimonium chloride, hectorite, hyaluroinic acid, hydrated silica, hydroxypropyl chitosan, hydroxypropyl guar, karaya gum, kelp, locust bean gum, natto gum, potassium alginate, potassium carrageenan, propylene glycol alginate, sclerotium gum, sodium carboxymethyl dextran, sodium carrageenan, tragacanth gum, xanthan gum, derivatives thereof and mixtures thereof.

Natural gums are polysaccharides of natural origin, capable of causing a large viscosity increase in solution, even at small concentrations. They can be used as thickening agents, gelling agents, emulsifying agents, and stabilizers. Most often these gums are found in the woody elements of plants or in seed coatings. Natural gums can be classified according to their origin. They can also be classified as uncharged or ionic polymers (polyelectrolytes), examples of which include the following. Natural gums obtained from seaweeds, such as: agar; alginic acid; sodium alginate; and carrageenan. Natural gums obtained from non-marine botanical resources include: gum arabic, from the sap of *Acacia* trees; gum ghatti, from the sap of *Anogeissus* trees; gum tragacanth , from the sap of *Astragalus* shrubs; karaya gum, from the sap of *Sterculia* trees. Examples of uncharged gums include: guar gum, from guar beans, locust bean gum, from the seeds of the carob tree; beta-glucan, from oat or barley bran; chicle gum, an older base for chewing gum obtained from the chicle tree; dammar gum, from the sap of Dipterocarpaceae trees; glucomannan from the konjac plant; mastic gum, a chewing gum from ancient Greece obtained from the mastic tree; psyllium seed husks, from the *Plantago* plant; spruce gum, a

chewing gum of American Indians obtained from spruce trees; tara gum, from the seeds of the tara tree. Natural gums produced by bacterial fermentation include gellan gum and xanthan gum.

Superabsorbent Polymer

The term "superabsorbent polymer" is understood to mean a polymer which is capable, in its dry state, of spontaneously absorbing at least 20 times its own weight of aqueous fluid, in particular of water and especially of distilled water. Such superabsorbent polymers are described in the work "Absorbent Polymer Technology, Studies in Polymer Science 8" by L. Brannon-Pappas and R. Harland, published by Elsevier, 1990.

These polymers have a high capacity for absorbing and retaining water and aqueous fluids. After absorption of the aqueous liquid, the particles of the polymer thus impregnated with aqueous fluid remain insoluble in the aqueous fluid and thus retain their separated particulate state.

Superabsorbent polymers are now commonly made from the polymerization of acrylic acid blended with sodium hydroxide in the presence of an initiator to form a poly-acrylic acid sodium salt (sometimes referred to as sodium polyacrylate). This polymer is the most common type of superabsorbent polymers made in the world today. Other materials are also used to make a superabsorbent polymer, such as polyacrylamide copolymer, ethylene maleic anhydride copolymer, cross-linked carboxymethylcellulose, polyvinyl alcohol copolymers, cross-linked polyethylene oxide, and starch grafted copolymer of polyacrylonitrile to name a few. The latter is one of the oldest superabsorbent polymers forms created. Today superabsorbent polymers are made using one of three primary methods; gel, polymerization, suspension polymerization or solution polymerization.

Gel Polymerization involves a mixture of frozen acrylic acid, water, cross-linking agents and UV initiator chemicals are blended and placed either on a moving belt or in large tubs. The liquid mixture then goes into a "reactor" which is a long chamber with a series of strong UV lights. The UV radiation drives the polymerization and cross-linking reactions. The resulting "logs" are sticky gels containing 60-70% water. The logs are shredded or ground and placed in various sorts of driers. Additional cross-linking agent may be sprayed on the particles' surface; this "surface cross-linking" increases the product's ability to swell under pressure -- a property measured as Absorbency Under Load (AUL) or Absorbency Against Pressure (AAP). The dried polymer particles are then screened for proper particle size distribution and packaging. The Gel Polymerization (GP) method is currently the most popular method for making the sodium polyacrylate superabsorbent polymers now used in baby diapers and other disposable hygienic articles.

Solution polymers, those made by solution polymerization, offer the absorbency of a granular polymer supplied in solution form. Solutions and can be diluted with water prior to application. Can coat most substrates or used to saturated. After drying at a specific temperature for a specific time, the result is a coated substrate with superabsorbent functionality. For example, this chemistry can be applied directly onto wires & cables, though it is especially optimized for use on components such as rolled goods or sheeted substrates.

Solution based polymerization is commonly used today for SAP manufacture of co-polymers -- particularly those with the toxic acrylamide monomer. This process is efficient and generally has a lower capital cost base. The solution process uses a water based monomer solution to produce a mass of reactant polymerized gel. The polymerization's own reaction energy (exothermic) is used to drive much of the process, helping reduce manufacturing cost. The reactant polymer gel is then chopped, dried and ground to its final granule size. Any treatments to enhance performance characteristics of the SAP are usually accomplished after the final granule size is created.

Superabsorbent polymers can also be made by suspension polymerization. This process suspends the water-based reactant in a hydrocarbon-based solvent. The net result is that the suspension polymerization creates the primary polymer particle in the reactor rather than mechanically in post-reaction stages. Performance enhancements can also be made during, or just after, the reaction stage.

The superabsorbent polymer can have a water-absorbing capacity ranging from 20 to 2000 times its own weight (i.e., 20 g to 2000 g of water absorbed per gram of absorbent polymer), preferably from 30 to 1500 times and better still ranging from 50 to 1000 times, and even more preferably 400 times. These water-absorbing characteristics are defined at standard temperature (25°C.) and pressure (760 mm Hg, i.e. 100 000 Pa) conditions and for distilled water. The value of the water-absorbing capacity of a polymer can be determined by dispersing 0.5 g of polymer(s) in 150 g of a water solution, by waiting 20 minutes, by filtering the nonabsorbed solution through a 150 μm filter for 20 minutes and by weighing the nonabsorbed water.

The superabsorbent polymer used in the composition of the invention is preferably provided in the form of particles which, once hydrated, swell with the formation of soft beads having a number-average diameter of 10 μm to 1000 μm.

The superabsorbent polymers used in the present invention are preferably crosslinked acrylic homo- or copolymers which are preferably neutralized and which are provided in the particulate form.

Mention may in particular be made of the polymers chosen from: crosslinked sodium polyacrylates, such as, for example, those sold under the names Octacare X100, X110 and RM100 by Avecia, those sold under the names Flocare GB300 and Flosorb 500 by SNF, those sold under the names Luquasorb 1003, Luquasorb 1010, Luquasorb 1280 and Luquasorb 1100 by BASF, those sold under the names Water Lock G400 and G430 (INCI name: Acrylamide/Sodium Acrylate Copolymer) by Grain Processing, or Aqua Keep 10 SH NF, Aqua Keep 10 SH NFC, sodium acrylate crosspolymer-2, provided by Sumitomo Seika, starches grafted by an acrylic polymer (homopolymer or copolymer) and in particular by sodium polyacrylate, such as those sold under the names Sanfresh ST-100C, ST100MC and IM-300MC by Sanyo Chemical Industries (INCI name: Sodium Polyacrylate Starch), hydrolysed starches grafted by an acrylic polymer (homopolymer or copolymer), in particular the acryloacrylamide/sodium acrylate copolymer, such as those sold under the names Water Lock A-240, A-180, B-204, D-223, A-100, C-200 and D-223 by Grain Processing (INCI name: Starch/Acrylamide/Sodium Acrylate Copolymer),

Preferably, the superabsorbent polymer is a sodium polyacrylate starch that in its non-swollen state exhibits a number-average size of less than or equal to 100 μm, preferably of less than or equal to 50 μm, for example ranging from 2 μm to 100 μm, with a median particle size of 25, or preferably in the range of about 2 μm to about 40 μm with a median particle size of 12. The viscosity of a solution in 1% water is preferably in the range of 20 to 30 Pas, even more preferably 22 to 29 Pas, at a pH of 4, and in the range of 23 to 28 Pas, at a pH of 7. Preferred superabsorbent polymers include Makimousse 12 and Makimouse 25 supplied by Kobo Products Inc.

The superabsorbent polymer can be present in the composition of the invention in a content as active material ranging, for example, from 0.01 to 10% by weight, preferably from 0.05 to 6% by weight, preferably from 0.1 to 4% by weight, preferentially from 0.1 to 3% by weight, indeed even from 0.1 to 2% by weight, with respect to the total weight of the composition.

Silicone Elastomer

The composition of the present invention comprises a silicone elastomer, useful for reducing the tackiness of the composition and for providing a pleasant feel upon application. One non-limiting example of useful silicone elastomers is crosslinked organopolysiloxane (or siloxane) elastomers, as described in U.S. patent publication 2003/0049212A1. The elastomers may comprise emulsifying and non-emulsifying silicone elastomers. "Emulsifying," as used herein, means crosslinked organopolysiloxane elastomers having at least one polyoxyalkylene

(e.g., polyoxyethylene or polyoxypropylene) or polyglycerin moiety, whereas "non-emulsifying" means crosslinked organopolysiloxane elastomers essentially free of polyoxyalkylene or polyglycerin moeities.

The composition of the present invention may comprise from about 0.1% to about 20%, and alternatively from about 0.2% to about 10%, of a non-emulsifying crosslinked organopolysiloxane elastomer. Non-limiting examples of suitable non-emulsifying crosslinked organopolysiloxane elastomers include dimethicone crosspolymers, dimethicone/vinyl dimethicone crosspolymers, and copolymers, derivatives and mixtures thereof, supplied by Dow Corning™ (e.g. DC 9040, 9041, 9045, 8509, 9546, 9506); C30-45 alkyl cetearyl dimethicone crosspolymer, cetearyl dimethicone crosspolymer, and copolymers, derivatives and mixtures thereof, supplied by General Electric™ (e.g. Velvesil™ 125 and Velvesil™ DM); dimethicone/phenyl vinyl dimethicone crosspolymer, vinyl dimethicone/lauryl dimethicone crosspolymer, trifluoropropyl dimethicone/trifluoropropyl divinyldimethicone crosspolymer, and copolymers, derivatives and mixtures thereof, supplied by Shin Etsu™ (KSG-15, -15AP, -16, -17, -18, -41, -42, -43, -44, -51, -103), and the Grant Industries line of elastomers, available as GRANSIL™.

The composition of the present invention may comprise from about 0.1% to about 20%, and alternatively from about 0.2% to about 10%, of an emulsifying crosslinked organopolysiloxane elastomer, described in US Patents 5,412,004; 5,837,793; and 5,811,487. Non-limiting examples of suitable emulsifying elastomers include PEG-12 dimethicone crosspolymers, dimethicone/PEG-10/15 crosspolymer, dimethicone/PEG-10 crosspolymer, PEG-15/lauryl dimethicone crosspolymer, trifluoropropyl dimethicone/PEG-10 crosspolymer, dimethicone/polyglycerin-3 crosspolymer, lauryl dimethicone/polyglycerin-3 crosspolymer, all supplied by Shin Etsu™ (KSG-24, -21/210, -31/310, -32/320, -33/330, -34/340, -710, -810, -820, -830, and -840); polyoxyalkylene-modified elastomers formed from divinyl compounds, e.g. siloxane polymers with at least two free vinyl groups bonded via Si-H linkages on a polysiloxane backbone.

Suitable silicone elastomers include many commercial materials. An exemplary polyoxyethylene silicone elastomer includes dimethicone/PEG-10/15 crosspolymer (KSG-210 from Shin-Etsu Chemical Co, Ltd.).

Examples of alkyl-containing polyoxyethylene silicone elastomers include PEG-15 lauryl dimethicone crosspolymer (KSG-310, KSG-320, KSG-330, & KSG-340 from Shin-Etsu Chemical Co., Ltd.).

An example of polyglycerin-modified silicone elastomers includes dimethicone/ polyglycerin-3 crosspolymer (KSG-710 from Shin-Etsu Chemical Co., Ltd.).

Examples of alkyl-containing polyglycerin-modified silicone elastomers include lauryl dimethicone/polyglycerin-3 crosspolymer (KSG-810, KSG-820, KSG-830, & KSG-840 from Shin-Etsu Chemical Co., Ltd.).

Examples of polyoxypropylene silicone elasotmer includes dimethicone/bis-isobutyl PPG-20 crosspolymer (Dow Corning EL-8050, EL-8051, & EL-8052 from Dow Corning Corp.).

In select embodiments, the silicone elastomer is chosen from alkyl dimethicone/polyglycerin crosspolymers, dimethicone/polyglycerin crosspolymers, dimethicone/poly(propylene glycol) crosspolymers, dimethicone/poly(ethylene glycol) crosspolymers, alkyl dimethicone/poly(propylene glycol) crosspolymers, alkyl dimethicone/poly(ethylene glycol) crosspolymers, and alkyl dimethicone crosspolymers.

Additional Thickening Agents

The composition of the present invention may include one or more additional thickening agents. The composition of the present invention may comprise from about 0.1% to about 5%, or, alternatively, from about 0.2% to about 2%, of a thickening agent when present. Suitable classes of thickening agents include but are not limited to carboxylic acid polymers, polyacrylamide polymers, sulfonated polymers, copolymers thereof, hydrophobically modified derivatives thereof, and mixtures thereof.

One preferred thickener for use in the present invention is an acrylate cross linked silicone copolymer network (also sometimes referred to as “polyacrylate siloxane copolymer network”) and its method of making are fully disclosed in US Patent Publication 2008/0051497 A1, Lu et. al, which published on February 28, 2008. These copolymers comprise the reaction product of:

a) $M_aM^H_{b\text{-}h\text{-}k}M^{PE}_hM^E_kD_cD^H_{d\text{-}i\text{-}l}D^{PE}_iD^E_lTeT^H_{f\text{-}j\text{-}m}T^{PE}_jT^E_mQ_g$ and

b) a stoichiometric or super-stoichiometric quantity of acrylate where:

$M=R^1R^2R^3SiO_{1/2}$;

$M^H=R^4R^5H\ SiO_{1/2}$;

$M^{PE}=R^4R^5(\text{--}CH_2CH(R^9)(R^{10})_nO(R^{11})_o(C_2H_4O)_p(C_3H_6O)_q(C_4H_8O)_rR^{12})SiO_{1/2}$;

$M^E=R^4R^5(\text{--}R^{17}R^{18}C\text{--}CR^{16}Q_sQ_tR^{15}(COC)R^{13}R^{14})SiO_{1/2}$

$D=R^6R^7SiO_{2/2}$; and

$D^H=R^8HSiO_{2/2}$

$D^{PE}=R^8(--CH_2CH(R^9)(R^{10})_nO(R^{11})_o(C_2H_4O)_p(C3H_6O)_q(C_4H_8O)_rR^{12})SiO_{2/2}$

$D^{E}=R^8(--R^{17}R^{18}C--CR^{16}Q_sQ_tR^{15}(COC)- R^{13}R^{14})SiO_{2/2}$.

$T^{H}=HSiO_{3/2}$;

$T^{PE}=(--CH_2CH(R^9)(R^{10})_nO(R^{11})_o(C_2H_4O)_p(C_3H_6O)_q(C_4H_8O)_rR^{12})SiO_{3/2}$;

$T^{E}=(--R^{17}R^{18}C--CR^{16}Q_sQ_tR^{15}(COC)R^{13}R^{14})SiO_{3/2}$; and

$Q=SiO_{4/2}$;

where R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8 and R^9 are each independently selected from the group of monovalent hydrocarbon radicals having from 1 to 60 carbon atoms;

R^9 is H or a 1 to 6 carbon atom alkyl group; R^{10} is a divalent alkyl radical of 1 to 6 carbons;

R^{11} is selected from the group of divalent radicals consisting of $--C_2H_4O--$, $--C_3H_6O--$, and $--C_4H_8O--$; R^{12} is H, a monofunctional hydrocarbon radical of 1 to 6 carbons, or acetyl; R^{13}, R^{14}, R^{15}, R^{16}, R^{17} and R^{18} are each independently selected from the group of hydrogen and monovalent hydrocarbon radicals having from one to sixty carbon atoms.

Q_t is a di- or trivalent hydrocarbon radical having from one to sixty carbon atoms, Q_s is a divalent hydrocarbon radical having from one to sixty carbon atoms subject to the limitation that when Q_t is trivalent R^{14} is absent and Q_s forms a bond with the carbon bearing R^{13} where R^{16} and R^{18} may be either cis- or trans- to each other; the subscript a may be zero or positive subject to the limitation that when the subscript a is zero, b must be positive; the subscript b may be zero or positive subject to the limitation that when b is zero, the subscript a must be positive; the subscript c is positive and has a value ranging from about 5 to about 1,000; the subscript d is positive and has a value ranging from about 3 to about 400; the subscript e is zero or positive and has a value ranging from 0 to about 50; the subscript f is zero or positive and has a value ranging from 0 to about 30; the subscript g is zero or positive and has a value ranging from 0 to about 20; the subscript h is zero or positive and has a value ranging from 0 to about 2 subject to the limitation that the sum of the subscripts h, i and j is positive; the subscript i is zero or positive and has a value ranging from 0 to about 200 subject to the limitation that the sum of the subscripts h, i and j is positive; the subscript j is zero or positive and has a value ranging from 0 to about 30 subject to the limitation that the sum of the subscripts h, i and j is positive; the subscript k is zero or positive and has a value ranging from 0 to about 2 subject to the limitation that the sum of the subscripts k, l and m is positive; the subscript l is zero or positive and has a value ranging from 0 to about 200 subject to the limitation that the sum of the subscripts k, l and m is positive; the subscript m is zero or positive and has a value ranging from 0 to about 30 subject to the limitation that the sum of the subscripts k, l and m is positive; the subscript n is

zero or one; the subscript o is zero or one; the subscript p is zero or positive and has a value ranging from 0 to about 100 subject to the limitation that (p+q+r)>0; the subscript q is zero or positive and has a value ranging from 0 to about 100 subject to the limitation that (p+q+r)>0; the subscript r is zero or positive and has a value ranging from 0 to about 100 subject to the limitation that (p+q+r)>0; the subscript s is zero or one; the subscript t is zero or one; and c) a free radical initiator.

As used herein, integer values of stoichiometric subscripts refer to molecular species and non-integer values of stoichiometric subscripts refer to a mixture of molecular species on a molecular weight average basis, a number average basis or a mole fraction basis. The phrases sub-stoichiometric and super stoichiometric refer to relationships between reactants. Sub stoichiometric refers to a quantity of reactant that is less than the quantity of reactant required for full stoichiometric reaction of a substrate moiety with that reactant. Super stoichiometric refers to a quantity of reactant that is more than that quantity of reactant required for full stoichiometric reaction of a substrate moiety with that reactant. As used herein "super stoichiometric" can under some circumstances be equivalent to an excess that is either a stoichiometric excess, i.e. a whole number multiple of a stoichiometric quantity, or a non-stoichiometric excess.

As used herein the word "acrylate" is a collective noun for the following chemical species: acrylic acid and methacrylic acid or ester derivatives thereof such as methyl, ethyl, butyl, amyl, 2-ethylhexyl, cyclohexyl, vinyl, ally, hydroxyethyl, perfluoroethyl, isobornyl, phenoxyethyl, tetraethylene glycol, tripropylene glycol, trimethylolpropane, polyoxyalkylene, organic modified polysiloxane (for example, the acrylated hydrophilic polysiloxane used as the emulsion precursor in U.S. Pat. No. 6,207,782), anionic acrylates/methacrylates such as sulfate, sulfonate or phosphate functionalized acrylate or mixtures thereof and any catalyst necessary for reaction with the epoxy or oxirane group. A single acrylate or various combinations of acrylates and methacrylates may be employed. A preferred acrylate cross linked silicone copolymer is a polyacrylate cross polymer from Momentive.

Suitable thickening agents include carboxylic acid polymers such as the carbomers (*e.g.*, the CARBOPOL® 900 series such as CARBOPOL® 954). Other suitable carboxylic acid polymeric agents include copolymers of C_{10-30} alkyl acrylates with one or more monomers of acrylic acid, methacrylic acid, or one of their short chain (*i.e.*, C_{1-4} alcohol) esters, wherein the crosslinking agent is an allyl ether of sucrose or pentaerytritol. These copolymers are known as acrylates/C_{10-30} alkyl acrylate crosspolymers and are commercially available as CARBOPOL® 1342, CARBOPOL® 1382, PEMULEN TR-1, and PEMULEN TR-2, from Noveon, Inc.

Other suitable thickening agents include the polyacrylamide polymers and copolymers. An exemplary polyacrylamide polymer has the CTFA designation "polyacrylamide and isoparaffin and laureth-7" and is available under the trade name SEPIGEL 305 from Seppic Corporation (Fairfield, N.J.). Other polyacrylamide polymers useful herein include multi-block copolymers of acrylamides and substituted acrylamides with acrylic acids and substituted acrylic acids. Commercially available examples of these multi-block copolymers include HYPAN SR150H, SS500V, SS500 W, SSSA100H, from Lipo Chemicals, Inc., (Patterson, N.J.).

Other suitable thickening agents useful herein are sulfonated polymers such as the CTFA designated sodium polyacryloyldimethyl taurate available under the trade name Simulgel 800 from Seppic Corp. and Viscolam At 100 P available from Lamberti S.p.A. (Gallarate, Italy). Another commercially available material comprising a sulfonated polymer is Sepiplus 400 available from Seppic Corp.

Clays may be useful to provide structure or thickening. Suitable clays can be selected, e.g., from montmorillonites, bentonites, hectorites, attapulgites, sepiolites, laponites, silicates and mixtures thereof. Suitable water dispersible clays include bentonite and hectorite (such as Bentone EW, LT from Rheox); magnesium aluminum silicate (such as Veegum from Vanderbilt Co.); attapulgite (such as Attasorb or Pharamasorb from Engelhard, Inc.); laponite and montrnorillonite (such as Gelwhite from ECC America); and mixtures thereof.

Suitable thickening agents include cellulose and modified cellulosic compositions such as, carboxymethyl hydroxyethylcellulose, cellulose acetate propionate carboxylate, hydroxyethylcellulose, hydroxyethyl ethylcellulose, hydroxypropylcellulose, hydroxypropyl methylcellulose, methyl hydroxyethylcellulose, microcrystalline cellulose, sodium cellulose sulfate, and mixtures thereof. Also useful herein are the alkyl substituted celluloses. In these polymers some portion of the hydroxy groups of the cellulose polymer are hydroyxalkylated (preferably hydroxyethylated or hydroxypropylated) to form a hydroxyalkylated cellulose which is then further modified with a C_{10} -C_{30} straight chain or branched chain alkyl group through an ether linkage. Typically these polymers are ethers of C_{10} -C_{30} straight or branched chain alcohols with hydroxyalkylcelluloses. Examples of alkyl groups useful herein include those selected from the group consisting of stearyl, isostearyl, lauryl, myristyl, cetyl, isocetyl, cocoyl (i.e. alkyl groups derived from the alcohols of coconut oil), palmityl, oleyl, linoleyl, linolenyl, ricinoleyl, behenyl, and mixtures thereof. Preferred among the alkyl hydroxyalkyl cellulose ethers is the material given the CTFA designation cetyl hydroxyethylcellulose, which is the ether of cetyl alcohol and hydroxyethylcellulose. This material is sold under the tradename Natrosol® CS Plus from Aqualon Corporation.

Oil Phase

The thickened aqueous phase of this invention may be combined with, or emulsified with an oil phase to form an oil-in-water emulsion or a water-in-oil-in-water emulsion. Oils may be used to solubilize, disperse, or carry materials that are not suitable for water or water soluble solvents. Oils may be fluid at room temperature. The oils may be volatile or nonvolatile. "Non-volatile" means a material that exhibit a vapor pressure of no more than about 0.2 mm Hg at 25°C at one atmosphere and/or a material that has a boiling point at one atmosphere of at least about 300°C. "Volatile" means that the material exhibits a vapor pressure of at least about 0.2 mm of mercury at 20° C. Volatile oils may be used to provide a lighter feel when a heavy, greasy film is undesirable. Suitable oils include hydrocarbons, esters, amides, ethers, silicones, and mixtures thereof.

Suitable hydrocarbon oils include straight, branched, or cyclic alkanes and alkenes. The chain length may be selected based on desired functional characteristics such as volatility. Suitable volatile hydrocarbons may have between 5-20 carbon atoms or, alternately, between 8-16 carbon atoms.

Other suitable oils include esters. These esters include esters with hydrocarbyl chains derived from fatty acids or alcohols (*e.g.*, mono-esters, polyhydric alcohol esters, and di- and tri-carboxylic acid esters). The hydrocarbyl radicals of the esters hereof may include or have covalently bonded thereto other compatible functionalities, such as amides and alkoxy moieties (*e.g.*, ethoxy or ether linkages, etc.). Exemplary esters include, but are not limited to, isopropyl isostearate, hexyl laurate, isohexyl laurate, isohexyl palmitate, isopropyl palmitate, decyl oleate, isodecyl oleate, hexadecyl stearate, decyl stearate, isopropyl isostearate, dihexyldecyl adipate, lauryl lactate, myristyl lactate, cetyl lactate, oleyl stearate, oleyl oleate, oleyl myristate, lauryl acetate, cetyl propionate, C12-15 alkyl benzoate, butyloctyl salicylate, phenylethyl benzoate, dicaprylyl carbonate, dioctyl malate, dicaprylyl maleate, isononyl isononanoate, propylene glycol dicaprate, diisopropyl adipate, dibutyl adipate, and oleyl adipate. Other suitable esters are further described in the Personal Care Product Council's *International Cosmetic Ingredient Dictionary and Handbook*, Thirteenth Edition, 2010, under the functional category of "Esters." Other esters suitable for use in the personal care composition include those known as polyhydric alcohol esters and glycerides.

Other suitable oils include amides. Amides include compounds having an amide functional group while being liquid at 25 °C and insoluble in water. Suitable amides include, but are not limited to, N-acetyl-N-butylaminopropionate, isopropyl N-lauroylsarcosinate,

butylphthalimide, isopropylphthalimide, and N,N,-diethyltoluamide. Other suitable amides are disclosed in U.S. Patent No. 6,872,401.

Other suitable oils include ethers. Suitable ethers include saturated and unsaturated fatty ethers of a polyhydric alcohol, and alkoxylated derivatives thereof. Exemplary ethers include, but are not limited to, C_{4-20} alkyl ethers of polypropylene glycols, and di-C_{8-30} alkyl ethers. Suitable examples of these materials include PPG-14 butyl ether, PPG-15 stearyl ether, PPG-11 stearyl ether, dioctyl ether, dodecyl octyl ether, and mixtures thereof.

Suitable silicone oils include polysiloxanes. Polylsiloxanes may have a viscosity of from about 0.5 to about 1,000,000 centistokes at 25°C. Such polysiloxanes can be represented by the general chemical formula:

$$R_3SiO[R_2SiO]_xSiR_3$$

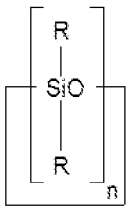
wherein R is independently selected from hydrogen or C_{1-30} straight or branched chain, saturated or unsaturated alkyl, phenyl or aryl, trialkylsiloxy; and x is an integer from 0 to about 10,000, chosen to achieve the desired molecular. In certain embodiments, R is hydrogen, methyl, or ethyl. Commercially available polysiloxanes include the polydimethylsiloxanes, which are also known as dimethicones, examples of which include the DM-Fluid series from Shin-Etsu, the Vicasil® series sold by Momentive Performance Materials Inc., and the Dow Corning® 200 series sold by Dow Corning Corporation. Specific examples of suitable polydimethylsiloxanes include Dow Corning® 200 fluids (also sold as Xiameter® PMX-200 Silicone Fluids) having viscosities of 0.65, 1.5, 50, 100, 350, 10,000, 12,500 100,000, and 300,000 centistokes.

Suitable dimethicones include those represented by the chemical formula:

$$R_3SiO[R_2SiO]_x[RR'SiO]_ySiR_3$$

wherein R and R' are each independently hydrogen or C_{1-30} straight or branched chain, saturated or unsaturated alkyl, aryl, or trialkylsiloxy; and x and y are each integers of 1 to 1,000,000 selected to achieve the desired molecular weight. Suitable silicones include phenyl dimethicone (Botansil™ PD-151 from Botanigenics, Inc.), diphenyl dimethicone (KF-53 and KF-54 from Shin-Etsu), phenyl trimethicone (556 Cosmetic Grade Fluid from Dow Corning), or trimethylsiloxyphenyl dimethicone (PDM-20, PDM-200, or PDM-1000 from Wacker-Belsil). Other examples include alkyl dimethicones wherein at least R' is a fatty alkyl (*e.g.*, C_{12-22}). A suitable alkyl dimethicone is cetyl dimethicone, wherein R' is a straight C16 chain and R is methyl. Cetyl dimethicone, is available as s 2502 Cosmetic Fluid from Dow Corning or as Abil Wax 9801 or 9814 from Evonik Goldschmidt GmbH.

Cyclic silicones are one type of silicone oil that may be used in the composition. Such silicones have the general formula:



wherein R is independently selected from hydrogen or C_{1-30} straight or branched chain, saturated or unsaturated alkyl, phenyl or aryl, trialkylsiloxy; and where n=3-8 and mixtures thereof. Commonly, a mixture of cyclomethicones is used where n is 4, 5, and/or 6. Commercially available cyclomethicones include Dow Corning UP-1001 Ultra Pure Fluid (*i.e.* n=4), Dow Corning XIAMETER® PMX-0245 (*i.e.* n=5), Dow Corning XIAMETER® PMX-0245 (*i.e.* n=6), Dow Corning 245 fluid (*i.e.* n=4 and 5), and Dow Corning 345 fluid (*i.e.* n=4, 5, and 6).

UV Actives

The compositions of this invention may comprise a UV active. As used herein, "UV active" includes both sunscreen agents and physical sunblocks. Suitable UV actives may be organic or inorganic. Suitable UV actives are listed in the functional category of "Sunscreen Agents" in the Personal Care Product Council's *International Cosmetic Ingredient Dictionary and Handbook*, Thirteenth Edition, 2010. The composition may comprise from may comprise an amount of UV active prescribed or proposed by regulatory agencies in the US (e.g., 21 CFR part 352, 68 Federal Register 41386, 70 Federal Register 72449, or 71 Federal Register 42405), Europe (Regulation No 1223/2009 of the EU Parliament; Annex VI), Japan, China, Australia, New Zealand, or Canada. In particular embodiments, the composition comprises from about 1%, 2%, or 3% to about 40%, 30%, or 20%, by weight of the composition, UV active. In another embodiment, the composition may comprise a sufficient about of UV active to yield a Sun Protection Factor of at least about 15, 30 45, or 50. SPF testing is conventional and well understood in the art. A suitable SPF test is prescribed in 21 C.F.R. 352, Subpart D.

Suitable UV actives include dibenzoylmethane derivatives including 2-methyldibenzoylmethane, 4-methyldibenzoylmethane, 4-isopropyldibenzoylmethane, 4-tert-butyldibenzoylmethane, 2,4- dimethyldibenzoylmethane, 2,5- dimethyldibenzoylmethane, 4,4'-diisopropyldibenzoylmethane, 4,4'-dimethoxy dibenzoylmethane, 4-tert-butyl-4'-methoxy dibenzoylmethane (*i.e.*, butyl methoxydibenzoylmethane or avobenzone)(commercially available as PARSOL® 1789 from DSM), 2-methyl-5-isopropyl-4'-methoxy dibenzoylmethane, 2-methyl-5-tert-butyl-4'-methoxydibenzoylmethane, 2,4-dimethyl-4'-methoxy dibenzoylmethane, and 2,6-dimethyl-4-tert-butyl-4'-methoxy dibenzoylmethane. Other suitable UV actives include 2-ethylhexyl-p-methoxycinnamate (commercially available as PARSOL® MCX from DSM), 2-hydroxy-4-methoxybenzophenone, benzonphenone-3 (i.e. oxybeznone), octyldimethyl-p-

aminobenzoic acid, digalloyltrioleate, 2,2-dihydroxy-4-methoxybenzophenone, ethyl-4-(bis(hydroxy-propyl))aminobenzoate, 2-ethylhexyl-2-cyano-3,3-diphenylacrylate, 2-ethylhexyl salicylate, homomenthyl salicylate, glyceryl-p-aminobenzoate, 3,3,5-tri-methylcyclohexylsalicylate, methylanthranilate, p-dimethyl-aminobenzoic acid or aminobenzoate, 2-ethylhexyl-p-dimethyl-amino-benzoate, 2-phenylbenzimidazole-5-sulfonic acid, 2-(p-dimethylaminophenyl)-5-sulfonicbenzoxazoic acid, octocrylene, zinc oxide, titanium dioxide, and mixtures of these compounds.

Other suitable UV actives include 4-methylbenzylidene camphor (commercially available as PARSOL® 5000 from DSM or Eusolex 6300 from Merck), methylene bis-benzotriazolyl tetramethylbutylphenol (*i.e.*, bisoctrizole, commercially available as Tinosorb® M from BASF), bis-ethylhexyloxyphenol methoxyphenol triazine (*i.e.*, bemotrizinol,commercially available as Tinosorb® S from BASF), disodium phenyl dibenzimidazole tetrasulfonate (*i.e.*, Bisdisulizole disodium, commercially available as Neo Heliopan® AP from Symrise), ethylhexyl triazone (commercially available as Uvinul® T 150 from BASF), drometrizole trisiloxane (marketed as Mexoryl XL by L'Oreal), sodium dihydroxy dimethoxy disulfobenzophenone (*i.e.*, benzophenone-9, commercially available as Uvinul® DS 49 from BASF), diethylamino hydroxybenzoyl hexyl benzoate (commercially available as Uvinul® A Plus from BASF), diethylhexyl butamido triazone (*i.e.*, Iscotrizinol, commercially available as Uvasorb® HEB by 3V Sigma), polysilicone-15 (*i.e.*, commercially available as PARSOL® SLX from DSM), isoamyl p-methoxycinnamate (*i.e.*, amiloxate, commercially available as Neo Heliopan® E 1000 from Symrise), and mixtures thereof.

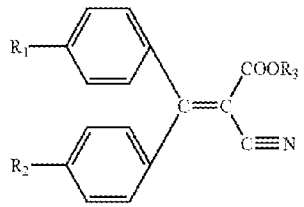
The UV actives of the present invention may be encapsulated. Examples of commercially available encapsulated sunscreen actives include, but are not limited to: Eusolex UV-Pearls 2292 (Merck / EMD Chemicals), which includes water, ethylhexyl methoxycinnamate, silica, phenoxyethanol, PVP, chlorphenesin, disodium EDTA, and BHT; Silasoma ME (Seiwa Kasei Co., Ltd), which includes water, polysilicone-14, and ethylhexyl methoxycinnamate; Silasoma MEA (Seiwa Kasei Co., Ltd), which includes water, polysilicone-14, ethylhexyl methoxycinnamate, and butyl methoxydibenzoylmethane; Silasoma MEP(S) (Seiwa Kasei Co., Ltd), which includes water, ethylhexyl methoxycinnamate, diethylamino hydroxybenzoyl hexyl benzoate, and polysilicone-14; Suncaps 664 (Particle Sciences, Inc.), which includes, ethylhexyl methoxycinnamate, synthetic beeswax, PEG-20, copernicia cerifera (carnauba) wax, Bis-PEG-12 dimethicone, beeswax, VP/Eicosene copolymer, sorbitan tristearate, steareth-100, and PEG-100 stearate; Suncaps 903 (Particle Sciences, Inc.), which includes ethylhexyl methoxycinnamate, benzophenone-3, synthetic beeswax, PEG-20, copernicia cerifera (carnauba) wax, Bis-PEG-12

dimethicone, beeswax, VP/Eicosene copolymer, sorbitan tristearate, steareth-100, and PEG-100 stearate; UV Pearls OMC (Sol Gel Technologies), which includes ethylhexyl methoxycinnamate, and silica; OMC-BMDBM (Sol Gel Technologies), which includes ethylhexyl methoxycinnamate, butyl methoxydibenzoylmethane, and silica; Tinosorb S Aqua (BASF), which includes, bis-ethylhexyloxyphenol methoxyphenyl triazine, and polymethyl methacrylate; Hybrid ABOS (Kobo), which includes, polymethylmethacrylate, butyl methoxydibenzoylmethane, and octyl salicylate; and Hybrid ABOMC (Kobo), which includes polymethylmethacrylate, butyl methoxydibenzoylmethane, and ethylhexyl methoxycinnamate.

Photostabilizer

When UV actives are used in the compositions of this invention, they may comprise a photostabilizer. The composition may comprise from about 0.0001%, 0.001%, 0.01%, 0.05%, 0.1%, 0.5%, or 1% to about 20%, 10%, 7%, or 5%, by weight of the composition, of one or more suitable photostabilizer.

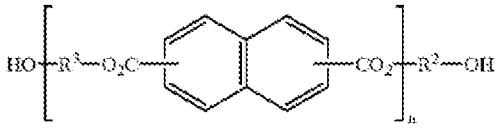
A suitable photostabilizer is alpha-cyanodiphenylacrylate is as disclosed in U.S. Patent No. 7,713,519. The alpha-cyanodiphenylacrylate may have the general formula:



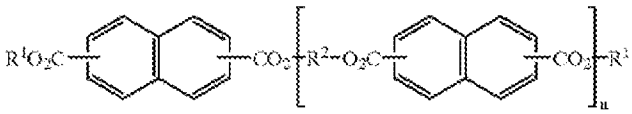
wherein one or both of R1 and R2 is independently a straight or branched chain C1-30 alkoxy radical and any non-alkoxy R1 or R2 radical is hydrogen; and R3 is a straight or branched chain C1-30 alkyl. Alternately, one or both of R1 and R2 is independently a C1-8 alkoxy radical and any non-alkoxy R1 or R2 radical is hydrogen; and R3 is a straight of branched chain C2-20 alkyl. Alternately, one or both of R1 and R2 is independently methoxy, and any non-methoxy R1 or R2 is hydrogen; and R3 is a straight or branched chain C2-20 alkyl.

A suitable alpha-cyanodiphenylacrylate is ethylhexyl methoxycrylene, or 2-ethylhexyl 2-cyano-3-(4-methoxyphenyl)-3-phenylpropenoate, wherein R1 is methoxy, R2 is hydrogen, and R3 is 2-ethylhexyl. This material is available from Hallstar Company under trade name Solastay® S1.

Another suitable photostabilizer includes diesters or polyesters of naphthalene dicarboxylic acid as disclosed in U.S. Patent Nos. 5,993,789, 6,113,931, 6,126,925 and 6,284,916. Suitable diesters or polyesters of naphthalene dicarboxylic acid may have the following formula:

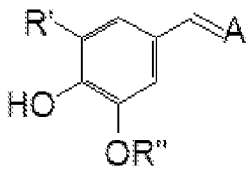


or



wherein each R^1 independently is an alkyl group having 1 to 22 carbon atoms, or a diol having the formula HO-R^2-OH, or a polyglycol having the formula HO-R^3-(-O-R^2-)$_m$-OH, and, wherein R^2 and R^3, same or different, are each an alkylene group, straight chain or branched, having 1 to 6 carbon atoms, wherein m and n are each 1 to about 100, 1 to about 10, or 2 to about 7. A suitable diester of naphthalene dicarboxylic acid is diethylhexyl 2,6-naphthalate available as Corapan® TQ from Symrise.

Another suitable photostabilizer is 4-hydroxybenzylidenemalonate derivatives or 4-hydroxycinnamate derivatives. Suitable materials may have the following formula:



wherein A is a chromophoric group that absorbs UV-radiation, comprises one divalent group or two monovalent groups with at least one group having carbonyl (C=O) functionality; R' is hydrogen, a linear or branched C_1-C_8 alkyl radical or a linear or branched C_1-C_8 alkoxy radical; and R" is a linear or branched C_1-C_8 alkyl radical. Exemplary compounds include ethyl-alpha-cyano-3,5-dimethoxy-4-hydroxy cinnamate, ethyl-alpha-acetyl-3,5-dimethoxy-4-hydroxy cinnamate, iso-propyl-alpha-acetyl-3,5-dimethoxy-4-hydroxy cinnamate, iso-amyl-alpha-acetyl-3,5-dimethoxy-4-hydroxy cinnamate, 2-ethylhexyl-alpha-acetyl-3,5-dimethoxy-4-hydroxy cinnamate, diethyl-3,5-dimethoxy-4-hydroxy benzylidene malonate, di-(2-ethylhexyl)-3,5-dimethoxy-4-hydroxy benzylidene malonate, diisoamyl-3,5-dimethoxy-4-hydroxy benzylidene malonate, didodecyl-3,5-dimethoxy-4-hydroxy benzylidene malonate, dipalmitoyl-3,5-dimethoxy-4-hydroxy benzylidene malonate, and di-isopropyl-3,5-dimethoxy-4-hydroxy benzylidene malonate. A particularly suitable compound is diethylhexyl syringylidenemalonate (INCI name) available under the tradename Oxynex® ST from EMD Chemicals, Inc. Additional suitable 4-hydroxybenzylidenemalonate derivatives or 4-hydroxycinnamate derivatives are disclosed in U.S. Patent No. 7,357,919 and U.S. Patent Application Publication No. 2003/0108492A1 and US2003/0157035A.

Other suitable photostabilizers include a 2-pyrrolidinone-4-carboxy ester compounds as described in U.S. Patent Application Publication No. 2010/0183529; silicon-containing s-triazines substituted with two aminobenzoate or aminobenzamide groups as described in U.S. Patent Application Publication No. 2008/0145324; fluorene derivatives as described in U.S. Patent Application Publications Nos. 2004/00579912, 2004/00579914, 200/00579916, and 2004/062726; piperidinol salts as described in U.S. Patent Application Publications No. 2005/0220727 including tris(tetramethylhydroxypiperidinol) citrate sold under the tradename Tinogard® Q by Ciba; and arylalkyl amides and esters as described in U.S. Patent Application Publication No. 2008/0019930.

Other suitable photostabilizers are listed in the functional category of "Light Stabilizers" in the Personal Care Product Council's *International Cosmetic Ingredient Dictionary and Handbook*, Thirteenth Edition, 2010.

Emulsifiers

The compositions of this invention may comprise an emulsifier. An emulsifier is particularly suitable when the phase is in the form of an emulsion or if immiscible materials are being combined. The phase may comprise from about 0.01%, 0.05%, or 0.1% to about 10%, 5%, or 2% emulsifier. Emulsifiers may be nonionic, anionic or cationic. Non-limiting examples of emulsifiers are disclosed in U.S. Patent 3,755,560, U.S. Patent 4,421,769, and McCutcheon's, *Emulsifiers and Detergents*, 2010 Annual Ed., published by M. C. Publishing Co.. Other suitable emulsifiers are further described in the Personal Care Product Council's *International Cosmetic Ingredient Dictionary and Handbook*, Thirteenth Edition, 2006, under the functional category of "Surfactants - Emulsifying Agents."

Suitable emulsifiers include the following classes of ethers and esters: ethers of polyglycols and of fatty alcohols, esters of polyglycols and of fatty acids, ethers of polyglycols and of fatty alcohols which are glycosylated, esters of polyglycols and of fatty acids which are glycosylated, ethers of C_{12-30} alcohols and of glycerol or of polyglycerol, esters of C_{12-30} fatty acids and of glycerol or of polyglycerol, ethers of oxyalkylene-modified C_{12-30} alcohols and of glycerol or polyglycerol, ethers of C_{12-30} fatty alcohols comprising and of sucrose or of glucose, esters of sucrose and of C_{12-30} fatty acids, esters of pentaerythritol and of C_{12-30} fatty acids, esters of sorbitol and/or of sorbitan and of C_{12-30} fatty acids, ethers of sorbitol and/or of sorbitan and of alkoxylated sorbitan, ethers of polyglycols and of cholesterol, esters of C_{12-30} fatty acids and of alkoxylated ethers of sorbitol and/or sorbitan, and combinations thereof.

Silicone emulsifiers may be use in the phase. Linear or branched type silicone emulsifiers may also be used. Particularly useful silicone emulsifiers include polyether modified

silicones such as KF-6011, KF-6012, KF-6013, KF-6015, KF-6015, KF-6017, KF-6043, KF-6028, and KF-6038 and polyglycerolated linear or branched siloxane emulsifiers such as KF-6100, KF-6104, and KF-6105; all from Shin Etsu.

Fatty Alcohols

The compositions of this invention may comprise one or more fatty alcohols. Fatty alcohols typically include monohydric alcohols having 8-22 carbon atoms although longer chain alcohols in excess of 30 carbons may be used. The fatty alcohols may be saturated or unsaturated. The fatty alcohols may be straight or branched. In particular, the phase may comprise straight chain, saturated fatty alcohol with a terminal hydroxyl. Suitable fatty alcohols include decyl alcohol, lauryl alcohol, myristyl alcohol, cetyl alcohol, stearyl alcohol, isostearyl alcohol, cetearyl alcohol, icosyl alcohol, behenyl alcohol. The phase may comprise from about 0.1%, 0.5%, 1%, 1.5%, 2%, 3%, 5% to about 5%, 7.5%, 10%, 15%, 20% of fatty alcohol.

Skin Care Active

The compositions of the present invention may comprise at least one additional skin care active. Many skin care actives may provide more than one benefit, or operate via more than one mode of action; therefore, classifications herein are made for the sake of convenience and are not intended to limit the active to that particular application or applications listed.

Vitamins

The compositions of the present invention may comprise from about 0.0001% to about 50%, alternatively from about 0.001% to about 10%, and alternatively from about 0.01% to about 5%, of one or more vitamins. Herein, "vitamins" means vitamins, pro-vitamins, and their salts, isomers and derivatives. Non-limiting examples of suitable vitamins include: vitamin B compounds (including B1 compounds, B2 compounds, B3 compounds such as niacinamide, niacinnicotinic acid, tocopheryl nicotinate, C1-C18 nicotinic acid esters, and nicotinyl alcohol; B5 compounds, such as panthenol or "pro-B5", pantothenic acid, pantothenyl; B6 compounds, such as pyroxidine, pyridoxal, pyridoxamine; carnitine, thiamine, riboflavin); vitamin A compounds, and all natural and/or synthetic analogs of Vitamin A, including retinoids, retinol, retinyl acetate, retinyl palmitate, retinoic acid, retinaldehyde, retinyl propionate, carotenoids (pro-vitamin A), and other compounds which possess the biological activity of Vitamin A; vitamin D compounds; vitamin K compounds; vitamin E compounds, or tocopherol, including tocopherol sorbate, tocopherol acetate, other esters of tocopherol and tocopheryl compounds; vitamin C compounds, including ascorbate, ascorbyl esters of fatty acids, and ascorbic acid derivatives, for example, ascorbyl phosphates such as magnesium ascorbyl phosphate and sodium ascorbyl phosphate, ascorbyl glucoside, and ascorbyl sorbate; and vitamin F compounds,

such as saturated and/or unsaturated fatty acids. In one embodiment, the composition comprises a vitamin selected from the group consisting of vitamin B compounds, vitamin C compounds, vitamin E compounds and mixtures thereof. Alternatively, the vitamin is selected from the group consisting of niacinamide, tocopheryl nicotinate, pyroxidine, panthenol, vitamin E, vitamin E acetate, ascorbyl phosphates, ascorbyl glucoside, and mixtures thereof.

Peptides and Peptide Derivatives

The compositions of the present invention may comprise one or more peptides. Herein, "peptide" refers to peptides containing ten or fewer amino acids, their derivatives, isomers, and complexes with other species such as metal ions (for example, copper, zinc, manganese, and magnesium). As used herein, peptide refers to both naturally occurring and synthesized peptides. In one embodiment, the peptides are di-, tri-, tetra-, penta-, and hexa-peptides, their salts, isomers, derivatives, and mixtures thereof. Examples of useful peptide derivatives include, but are not limited to, peptides derived from soy proteins, carnosine (beta-alanine-histidine), palmitoyl-lysine-threonine (pal-KT) and palmitoyl-lysine-threonine-threonine-lysine-serine (pal-KTTKS, available in a composition known as MATRIXYL®), palmitoyl-glycine-glutamine-proline-arginine (pal-GQPR, available in a composition known as RIGIN®), these three being available from Sederma, France, acetyl-glutamate-glutamate-methionine-glutamine-arginine-arginine (Ac-EEMQRR; Argireline®), and Cu-histidine-glycine-glycine (Cu-HGG, also known as IAMIN®).

The compositions may comprise from about $1x10^{-7}$% to about 20%, alternatively from about $1x10^{-6}$% to about 10%, and alternatively from about $1x10^{-5}$% to about 5% of the peptide.

Sugar Amines

The compositions of the present invention may comprise a sugar amine, also known as amino sugars, and their salts, isomers, tautomers and derivatives. Sugar amines can be synthetic or natural in origin and can be used as pure compounds or as mixtures of compounds (e.g., extracts from natural sources or mixtures of synthetic materials). For example, glucosamine is generally found in many shellfish and can also be derived from fungal sources. Sugar amine compounds useful in the present invention include, for example, N-acetyl-glucosamine, and also those described in PCT Publication WO 02/076423 and U.S. Patent No. 6,159,485, issued to Yu, et al. In one embodiment, the composition comprises from about 0.01% to about 15%, alternatively from about 0.1% to about 10%, and alternatively from about 0.5% to about 5%, of the sugar amine.

The compositions of the present invention further may comprise non-vitamin antioxidants and radical scavengers, hair growth regulators, flavonoids, minerals, preservatives, phytosterols

and/or plant hormones, protease inhibitors, tyrosinase inhibitors, anti-inflammatory agents and N-acyl amino acid compounds.

Suitable non-vitamin antioxidants and radical scavengers include, but are not limited to, BHT (butylated hydroxy toluene), L-ergothioneine (available as THIOTANE™); tetrahydrocurcumin, cetyl pyridinium chloride, carnosine, diethylhexyl syrinylidene malonate (available as OXYNEX™), hexadec-8-ene-1,16-dicarboxylic acid (octadecene dioic acid; ARLATONE™ Dioic DCA from Uniqema), ubiquinone (co-enzyme Q10), tea extracts including green tea extract, yeast extracts or yeast culture fluid (e.g., Pitera®), and combinations thereof.

Suitable hair growth regulators include, but are not limited to, hexamidine, butylated hydroxytoluene (BHT), hexanediol, panthenol and pantothenic acid derivates, their isomers, salts and derivatives, and mixtures thereof.

Suitable minerals include zinc, manganese, magnesium, copper, iron, selenium and other mineral supplements. "Mineral" is understood to include minerals in various oxidation states, mineral complexes, salts, derivatives, and combinations thereof.

Suitable examples of plant sterols (phytosterols) and/or plant hormones include, but are not limited to, sitosterol, stigmasterol, campesterol, brassicasterol, kinetin, zeatin, and mixtures thereof.

Suitable protease inhibitors include, but are not limited to, hexamidine, vanillin acetate, menthyl anthranilate, soybean trypsin inhibitor, Bowman-Birk inhibitor, and mixtures thereof.

Suitable tyrosinase inhibitors include, but are not limited to, sinablanca (mustard seed extract), tetrahydrocurcumin, cetyl pyridinium chloride, and mixtures thereof.

Suitable anti-inflammatory agents include, but are not limited to, glycyrrhizic acid (also known as glycyrrhizin, glycyrrhixinic acid, and glycyrrhetinic acid glycoside), glycyrrhetenic acid, other licorice extracts, and combinations thereof.

Suitable N-acyl amino acid compounds include, but are not limited to, N-acyl phenylalanine, N-acyl tyrosine, their isomers, including their D and L isomers, salts, derivatives, and mixtures thereof. An example of a suitable N-acyl amino acid is N-undecylenoyl-L-phenylalanine is commercially available under the tradename SEPIWHITE® from Seppic (France).

Other useful skin care actives include moisturizing and/or conditioning agents, such as glycerol, petrolatum, caffeine, and urea; yeast extracts (for example, Pitera™); dehydroepiandrosterone (DHEA), its analogs and derivatives; exfoliating agents, including alpha- and beta-hydroxyacids, alpha-keto acids, glycolic acid and octanoyl salicylate; antimicrobial agents; antidandruff agents such as piroctone olamine, 3,4,4'-trichlorocarbanilide

(trichlosan), triclocarban and zinc pyrithione; dimethyl aminoethanol (DMAE); creatine; skin lightening agents such as kojic acid, mulberry extract, hydroquinone, arbutin, and deoxy-arbutin; (sunless) tanning agents, such as dihydroxy acetone (DHA); isomers, salts, and derivatives of any of the foregoing; and mixtures thereof.

Humectants

The compositions of the present invention may include one or more humectants. The composition of the present invention may comprise from about 1% to about 30%; alternatively, from about 2% to about 20%; or, alternately, from about 3% to about 15% of the humectant, when present. An exemplary class of humectants is polyhydric alcohols. Suitable polyhydric alcohols include polyalkylene glycols and alkylene polyols and their derivatives, including propylene glycol, dipropylene glycol, polypropylene glycol, polyethylene glycol and derivatives thereof; sorbitol; hydroxypropyl sorbitol; erythritol; threitol; pentaerythritol; xylitol; glucitol; mannitol; hexylene glycol; butylene glycol (*e.g.*, 1,3-butylene glycol); pentylene glycol; hexane triol (*e.g.*, 1,2,6-hexanetriol); glycerine; ethoxylated glycerine; and propoxylated glycerine.

Other suitable humectants include sodium 2-pyrrolidone-5-carboxylate, guanidine; glycolic acid and glycolate salts (*e.g.*, ammonium and quaternary alkyl ammonium); lactic acid and lactate salts (*e.g.*, ammonium and quaternary alkyl ammonium); aloe vera in any of its variety of forms (*e.g.*, aloe vera gel); hyaluronic acid and derivatives thereof (*e.g.*, salt derivatives such as sodium hyaluronate); lactamide monoethanolamine; acetamide monoethanolamine; urea; panthenol; sodium pyroglutamate (NaPCA), water-soluble glyceryl poly(meth)acrylate lubricants (such as Hispagel®) and mixtures thereof.

Particulate Material

The compositions of the present invention may comprise from about 0.001% to about 40%, alternatively from about 1% to about 30%, and alternatively from about 2% to about 20%, of one or more particulate materials and/or cosmetic powders. Non-limiting examples of suitable powders include inorganic powders (for example, iron oxides, titanium dioxides, zinc oxides, silica), organic powders, composite powders, optical brightener particles, and mixtures of any of the foregoing. These particulates can, for instance, be platelet shaped, spherical, elongated or needle-shaped, or irregularly shaped; surface coated or uncoated; porous or non-porous; charged or uncharged; and can be added to the current compositions as a powder or as a pre-dispersion. In one embodiment, the particulate material is hydrophobically coated.

Suitable organic powders particulate materials include, but are not limited, to polymeric particles chosen from the methylsilsesquioxane resin microspheres, for example, Tospearl™ 145A, (Toshiba Silicone); microspheres of polymethylmethacrylates, for example, Micropearl™

M 100 (Seppic); the spherical particles of crosslinked polydimethylsiloxanes, for example, Trefil™ E 506C or Trefil™ E 505C (Dow Corning Toray Silicone); sphericle particles of polyamide, for example, nylon-12, and Orgasol™ 2002D Nat C05 (Atochem); polystyrene microspheres, for example Dyno Particles, sold under the name Dynospheres™, and ethylene acrylate copolymer, sold under the name FloBead™ EA209 (Kobo); aluminium starch octenylsuccinate, for example Dry Flo™ (Akzo Nobel); polymethyl silsesquioxane coated tapioca particles, for example Dry Flo TS™ (Akzo Nobel); microspheres of polyethylene, for example Microthene™ FN510-00 (Equistar), silicone resin, polymethylsilsesquioxane silicone polymer, platelet shaped powder made from L-lauroyl lysine, and mixtures thereof.

The composition of the present invention further may comprise interference pigments, including hydrophobically-modified interference pigments. Herein, "interference pigments" means thin, platelike layered particles having two or more layers of controlled thickness. The layers have different refractive indices that yield a characteristic reflected color from the interference of typically two, but occasionally more, light reflections, from different layers of the platelike particle. One example of interference pigments are micas layered with about 50 – 300 nm films of TiO_2, Fe_2O_3, silica, tin oxide, and/or Cr_2O_3 and include pearlescent pigments. Intereference pigments are available commercially from a wide variety of suppliers, for example, Rona (Timiron™ and Dichrona™), Presperse (Flonac™), Englehard (Duochrome™), Kobo (SK-45-R and SK-45-G), BASF (Sicopearls™) and Eckart (Prestige™). In one embodiment, the average diameter of the longest side of the individual particles of interference pigments is less than about 75 microns, and alternatively less than about 50 microns.

Colorants

The composition of the present invention may comprise from about 0.00001% to about 25%, and alternatively from about 0.01% to about 10%, of a colorant. Non-limiting classes of suitable colorants include, but are not limited to organic and/or inorganic pigments, natural and/or synthetic dyes, lakes, including FD&C and/or D&C lakes and blends, and mixtures of any of the foregoing.

Non-limiting examples of suitable colorants include iron oxides, ferric ammonium ferrocyanide, manganese violet, ultramarine blue, and chromium oxide, phthalocyanine blue and green pigment, encapsulated dyes, inorganic white pigments, for example TiO_2, ZnO, or ZrO_2, FD&C dyes, D&C dyes, and mixtures thereof.

Oil control agents

The compositions of the present invention may comprise one or more compounds useful for regulating the production of skin oil, or sebum, and for improving the appearance of oily skin.

Examples of suitable oil control agents include salicylic acid, dehydroacetic acid, benzoyl peroxide, vitamin B3 compounds (for example, niacinamide or tocopheryl nicotinate), their isomers, esters, salts and derivatives, and mixtures thereof. The compositions may comprise from about 0.0001% to about 15%, alternatively from about 0.01% to about 10%, alternatively from about 0.1% to about 5%, and alternatively from about 0.2% to about 2%, of an oil control agent.

Form

The oil in water emulsions of this invention can be personal care compositions, and specifically, the oil in water emulsions described herein may be in the form of a skin care composition, anti-perspirant, deodorant, cosmetic, and hair care product. The personal care composition may be a sun screen, a moisturizer, conditioner, anti-aging compound, skin lightener, sunless tanner, shave preparation, after-shave, foundation, lipstick, hair styling product, shampoo, cleanser, and combinations thereof. The personal care composition may be primarily used as a sunscreen. The emulsions and personal care compositions may be fluid or solid (gels, sticks, flowable solids, amorphous materials).

Examples

The following are examples of oil in water emulsions that are prepared as follows. The salt is formed by mixing NaOH with an excess of acid, the salt and remaining acid is then added to the water phase with the other water phase ingredients. Specifically, in a suitable vessel, the water phase ingredients are combined and heated to 75°C. The NaOH is added to an excess of acid, the salt and remaining acid is then added to composition. In a separate suitable vessel, the oil phase ingredients are combined and heated to 75°C. Next the oil phase is added to the water phase and the resulting emulsion is milled (*e.g.*, with a rotor-stator mill). The thickener is then added to the emulsion and the emulsion is cooled to 45°C while stirring. At 45°C, the remaining additional ingredients are added. The product is then cooled with stirring to 30°C, milled again, and then poured into suitable containers.

Examples 1 through 24 illustrate ingredients added to the water phase of a chassis (for example, the chassis of Example 28* below). As the salt concentration is increased, the emulsions begin to break down, that is, the phases separated. Adding small amounts of gum cured this problem.

It requires noting that many ingredients other than gums, were used in an attempt to cure the phase separation issue, and these attempts failed. See Examples 19-24. For example, fatty alcohols are believed to have a stabilizing affect on oil in water emulsions. But fatty alcohols did

not solve the problem. Other ingredients that that were tried, but failed to achieve phase stability were silica, Sepi MaxZen (an emulsifying thickener from Seppic), starches, for example tapioca. None of these stabilized the two phase emulsion. Increasing the amount of Makimousse 12, adding carbomer polymer thickeners (for example Ultrez 10 and Ultrez 21), and adding hydrophobic polymeric thickeners increased the viscosity of the emulsion, but did not substantially improve phase stability. Hence, those skilled in the art, in an attempt to solve the problem of phase stability might try many of these know methods to increase stability and they would fail. This renders the present solution surprising and unexpected.

Ex	% Maki-12	% Xanthan Gum	% Glyc. Acid	% Sal. Acid	% Citric Acid	% Lactic Acid	% Salt	pH	Phase Sep.
1	1.00	-	3.99	1.50	1.00	0.72	1.10	3.0	Yes
2	1.00	0.007	3.99	1.50	1.00	0.72	1.10	3.0	No
3	-	0.100	-	1.50	-	-	1.50	5.5	No
4	-	0.100	-	1.50	-	1.96	1.50	3.5	No
5	0.60	-	-	1.50	-	1.96	1.50	3.5	Yes
6	0.60	0.100	-	1.50	-	-	1.50	5.5	No
7	0.60	0.100	-	1.50	-	1.96	1.50	3.5	Yes
8	-	0.50	-	1.50	-	-	1.50	5.5	No
9	-	0.50	-	1.50	-	1.96	1.50	3.5	No
10	-	1.000	-	1.50	-	-	1.50	5.5	No
11	-	1.000	-	1.50	-	1.96	1.50	3.5	No
12	1.00	-	-	1.50	-	-	1.50	5.5	Yes
13	0.75	0.20	-	1.50	-	-	1.50	5.5	No
14	0.75	-	-	1.50	-	-	1.50	5.5	Yes
15	1.00	0.20	-	1.50	-	-	1.50	5.5	No
16	1.25	0.20	-	1.50	-	-	1.50	5.5	No
17	-	0.10	-	1.50	-	-	1.50	5.6	No
18	-	0.10	-	1.50	-	-	1.50	5.6	No

Examples 19-24 are compositions that failed at phase stability. Each of these examples contain no Xanthan gum, and 1.00% Makimousse 12. Known/conventional stabilizers were used to stabilize theses high salt composition ns without Xanthan gum. These known solutions did not work.

Ex.	% Fat. Alcohol	% Sepi Max Zen	% Tapioca Starch	% Silica	% Sal. Acid	% Salt	pH	Phase Sep.
19	1.05	0.10	-	-	1.50	1.10	3	Yes
20	1.05	0.20	-	-	1.50	1.10	3	Yes
21	1.05	0.30	-	-	1.50	1.10	3	Yes
22	1.05	0.30	-	-	1.50	1.10	3	Yes
23	1.05	0.30	3.00	-	1.50	1.10	3	Yes
24	1.05	0.30	-	0.20	1.50	1.10	3	Yes

Examples 25-27 are high salt containing, stable compositions that include UV actives.

	Ex. 25	Ex. 26	Ex. 27
Raw Material			
Water	Qs.	Qs.	Qs.
Homosalate	-	5.00	5.00
Oxybenzone	-	3.00	3.00
Avobenzone	3.00	3.00	3.00
Octocrylene	X	3.00	3.00
Octinoxate	7.50	-	-
Solastay	1.00	-	-
Phenoxyethanol	0.50	0.50	0.50
Glycerin	7.00	7.00	7.00
Niacinamide	5.00	5.00	5.00
Panthenol	0.50	0.50	0.50
Vitamin E Acetate	0.50	0.50	0.50
Salt			
Salicylic Acid	1.50	1.50	1.50
Sodium Hydroxide, 50% Soln	0.84	1.04	1.25
Xanthan Gum	0.10	0.05	0.20
Dry Flo TS	2.00	2.00	2.00
Simulgel EG	-	1.70	-
Stearyl Alcohol	0.40	0.40	0.40
Behenyl Alcohol	0.40	0.40	0.40
Cetyl Alcohol	0.30	0.30	0.30
PEG-100 Stearate	0.20	0.20	0.20
Emulgade	0.20	0.20	0.20
Stearic Acid	0.05	0.05	0.05
Ultrez-10	-	0.40	-
Makimousse-12	0.75	-	0.75
Keltrol T1000	0.10	0.10	0.10
Citric Acid	0.15	0.02	0.15
Disodium EDTA	0.05	0.05	0.05
Dow Corning 1503	2.00	2.00	2.00
	100.00	100.00	100.00

Sunscreen Compositions

The following are examples of sunscreen compositions that utilize combinations of superabsorbent polymers and silicone elastomers. The compositions in examples 22 to 27 are prepared as follows. In a suitable vessel, the water phase ingredients are combined and heated to 75°C. In a separate suitable vessel, the oil phase ingredients are combined and heated to 75°C. Next the oil phase is added to the water phase and the resulting emulsion is milled (*e.g.*, with a rotor-stator mill). The thickener is then added to the emulsion and the emulsion is cooled to

45°C while stirring. At 45°C, the remaining additional ingredients are added. The product is then cooled with stirring to 30°C, milled again, and then poured into suitable containers.

	28	29	30	31	32	33
Water Phase:						
Water	qs	qs	qs	qs	qs	qs
Glycerin	3.0	5.0	7.0	10.0	15.0	5.0
Disodium EDTA	0.1	0.1	0.05	0.1	0.05	0.05
Methylparaben	0.2	0.2	0.2	0.2	0.2	0.2
Salicylic Acid	-	1.50	1.50	1.50	1.50	1.50
Sodium Hydroxide, 50% Soln	-	1.04	0.84	1.04	0.84	1.25
Niacinamide	2.0	0.5	-	3.0	5.0	3.0
D-panthenol	0.5	0.1	1.0	0.5	0.5	0.5
Phenylbenzimidazole Sulfonic Acid	1.0	-	-	0.5	-	-
Triethanolamine	0.64	-	-	0.32	-	-
Benzyl alcohol	0.25	0.25	0.25	0.25	0.25	0.25
Oil Phase:						
Isopropyl Isostearate	2.0	2.0	2.0	1.0	-	-
Isopropyl lauroylsarcosinate	-	4.0	2.0	7.0	-	6.0
EL8051 IN[1]	4.0	-	-	5.0	5.0	10.0
Octisalate	4.0	4.0	4.0	-	-	4.0
Homosalate	-	8.0	-	-	-	-
Octocrylene	1.0	2.0	-	-	2.0	2.0
Octinoxate	-	-	6.0	5.0	7.5	-
Tinosorb S[2]	-	-	-	3.0	-	2.0
Oxybenzone	-	4.0	-	-	-	-
Avobenzone	2.0	3.0	2.0	-	---	2.0
Solastay S1[3]	-	-	2.0	-	-	2.0
Vitamin E Acetate	0.5	0.1	0.5	0.1	0.1	0.1
Ethylparaben	0.2	0.2	0.2	0.2	0.2	0.2
Propylparaben	0.2	0.2	0.2	0.2	0.2	0.2
Cetyl alcohol	1.0	0.3	1.0	0.6	0.6	1.0
Stearyl alcohol	1.0	0.4	1.0	0.8	0.8	1.0
Behenyl alcohol	1.0	0.4	1.0	0.8	0.8	1.0
Cetearyl Glucoside	0.3	0.3	0.3	0.3	0.3	0.3
PEG-100 stearate	0.3	0.3	0.3	0.3	0.3	0.3
Thickener:						
Keltrol CG-SFT[4]	-	0.10	0.10	0.20	0.05	0.10
Veegum Ultra[5]	-	-	-	-	0.5	-
Methocel 40-101[6]	-	-	-	-	0.2	-
Simulgel INS-100[7]	-	-	-	0.5	-	-
Sepigel 305[8]	-	-	-	0.5	-	-
Makimousse-12[9]	-	0.6	0.4	0.3	0.2	-
Makimousse-25[10]	-	-	-	-	0.2	0.6
Aqua Keep 10SH-NF[11]	-	-	-	-	-	-
Additional Ingredients:						
Fragrance	-	0.1	0.1	0.1	0.1	-
EL7040[12]	-	10.0	5.0	-	-	-

Tapioca Pure[13]	1.0	1.0	-	2.0	-	-
DryFlo TS[14]	2.0	-	5.0	-	-	-
Tinosorb M[15]	-	-	-	4.0	8.0	4.0
DC 1503[16]	2.0	1.0	-	-	-	-
Total:	100%	100%	100%	100%	100%	100%

[1] Isodecyl neopentanoate and dimethicone/bis isobutyl PPG-20 crosspolymer, from Dow Corning
[2] Bemotrizinol, from BASF
[3] Ethylhexyl Methoxycrylene, from Hallstar
[4] Xanthan gum, from CP Kelco
[5] Magnesium aluminum silicate, from RT Vanderbilt Inc.
[6] Hydroxypropyl methylcellulose, from Dow Chemical Co.
[7] Sodium acrylate / sodium acryloyldimethyl taurate copolymer, isohexadecane, and polysorbate 80, from Seppic
[8] Polyacrylamide, C13-14 isoparaffin, and laureth-7, from Seppic
[9] Sodium polyacrylate starch, from Kobo Products Inc.
[10] Sodium polyacrylate starch, from Kobo Products Inc.
[11] Sodium polyacrylate, from Kobo Products Inc.
[12] Caprylyl methicone and PEG-12 dimethicone / PPG-20 crosspolymer
[13] Tapioca powder, from Akzo Nobel
[14] Tapioca and polymethylsilsesquioxane, from Akzo Nobel
[15] Bisoctrizole, decyl glucoside, xanthan gum, propylene glycol, and water, from BASF
[16] Dimethicone and dimethiconol, from Dow Corning

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

Every document cited herein, including any cross referenced or related patent or application, is hereby incorporated herein by reference in its entirety unless expressly excluded or otherwise limited. The citation of any document is not an admission that it is prior art with respect to any invention disclosed or claimed herein or that it alone, or in any combination with any other reference or references, teaches, suggests or discloses any such invention. Further, to the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. An oil in water emulsion comprising:
   a) a water phase comprising:
      i) greater than about 0.5%, preferably greater than about 1.2%, even more preferably greater than about 1.5% of the salt form of a neutralized acid, the acid being preferably selected from the group consisting of salicylic acid, glycolic acid and combinations thereof, even more preferably the salt form of neutralized salicylic acid; and,
      ii) from about 2% to about 0.001%, preferably from about 1.5% to about 0.1%, even more preferably from about 1.0% to about 0.5%, by weight of a gum;
   b) An oil phase;

wherein the oil in water emulsion is substantially unaltered in chemical state and physical homogeneity, upon exposure to 14 days at a temperature of about 50 °C.

2. The oil in water emulsion of Claim 1 wherein the gum is ionic or non-ionic polysaccharide selected from the group consisting of acacia, agar, algin, alginic acid, ammonium alginate, amylopectin, calcium alginate, calcium carrageenan, carnitine, carrageenan, dextrin, gelatin, gellan gum, guar gum, guar hydroxypropyltrimonium chloride, hectorite, hyaluroinic acid, hydrated silica, hydroxypropyl chitosan, hydroxypropyl guar, karaya gum, kelp, locust bean gum, natto gum, potassium alginate, potassium carrageenan, propylene glycol alginate, sclerotium gum, sodium carboxymethyl dextran, sodium carrageenan, tragacanth gum, xanthan gum, derivatives thereof and mixtures thereof, preferably the gum is xanthan gum.

3. The oil in water emulsion of Claim 1, further comprising from about 0.01 to about 10%, preferably from about 0.05% to about 5%, and more preferably from about 0.1% to about 2%, by weight, of an emulsifier.

4. The oil in water emulsion of Claim 3, wherein the emulsifier is selected from a group consisting of ethers of glycerol, polyglycerol, sucrose, glucose, or sorbitol; esters of glycerol, polyglycerol, sucrose, glucose, or sorbitol; and mixtures thereof.

5. The oil in water emulsion of Claim 1 or 3, further comprising from about 1% to about 40%, preferably from about 2% to about 30%, and more preferably from about 3% to about 20%,

by weight, of a UV active selected from a group consisting of avobenzone, cinoxate, dioxybenzone, homosalate, menthyl anthranilate, octyl salicylate, oxybenzone, padimate O, phenylbenzimidazole sulfonic acid, sulisobenzone, trolamine salicylate, titanium dioxide, zinc oxide, diethanolamine methoxycinnamate, digalloy trioleate, ethyl dihydroxypropyl PABA, glyceryl aminobenzoate, lawsone with dihydroxyacetone, red petrolatum, ethylhexyl triazone, dioctyl butamido triazone, benzylidene malonate polysiloxane, terephthalylidene dicamphor sulfonic acid, disodium phenyl dibenzimidazole tetrasulfonate, diethylamino hydroxybenzoyl hexyl benzoate, bis diethylamino hydroxybenzoyl benzoate, bis benzoxazoylphenyl ethylhexylimino triazine, drometrizole trisiloxane, methylene bis-benzotriazolyl tetramethylbutylphenol, and bis-ethylhexyloxyphenol methoxyphenyltriazine, 4-methylbenzylidenecamphor, isopentyl 4-methoxycinnamate and combinations thereof, preferably the UV actives are encapsulated.

6. The oil in water emulsion of any of the preceding claims, further comprising a solvent is selected from a group consisting of di-isopropyl adipate, butyl phthalimide, isopropyl phthalimide, phenylethyl benzoate, dicaprylyl carbonate, isopropyl lauroylsarcosinate, isononyl isononanoate, butyl octylsalicylate, dioctyl malate, dicaprylyl maleate, isopropyl isostearate, propylene glycol dicaprate, esters of C12-C15 alcohol benzoates, isosorbide diesters, and derivatives and mixtures thereof.

7. The oil in water emulsion of Claim 5 further comprising a photostabilizer wherein the photostabilizer is selected from a group consisting of methoxycrylene, diethylhexyl 2,6-naphthalate, diethylhexyl syringylidenemalonate, and combinations thereof.

8. The oil in water emulsion of any of the preceding claims further comprising an active or agent selected from a group consisting of sugar amines, vitamins, oil control agents, humectants, emollients, photosterols, hexamidine compounds, tightening agents, anti-wrinkle actives, anti-atrophy actives, flavonoids, N-acyl amino acid compounds, retinoids, peptides, particulate materials, anti-cellulite agents, desquamation actives, anti-acne actives, anti-oxidants, radical scavengers, conditioning agents, anti-inflammatory agents, tanning actives, skin lightening agents, botanical extracts, antimicrobial actives, antifungal actives, antibacterial actives, antiperspirant actives, sensates, preservatives, anti-dandruff actives, substantivity polymers, detersive surfactants, and combinations thereof, wherein the vitamins are selected from vitamin B3 compound, ascorbic acid, tocopherol acetate, panthenol,

dexpanthenol, magnesium ascorbyl phosphate, sodium ascorbyl phosphate, retinyl propionate, and combinations thereof.

9. The oil in water emulsion of any of the preceding claims, wherein the oil phase is from about 1% to about 60%, preferably from about 2% to about 30%, and more preferably from about 3% to about 20%, by weight, of the emulsion.

10. The oil in water emulsion of any of the preceding claims, further comprising a superabsorbent polymer is selected from the group consisting of sodium polyacrylate, sodium polacrylate starch, sodium acrylates crosspolymer-2 and mixtures thereof.

11. The oil in water emulsion of any of the preceding claims, further comprising a silicone elastomer, which is a non-emulsifying elastomers that is prefeably selected from the group consisting of dimethicone crosspolymers, dimethicone/vinyl dimethicone crosspolymers, copolymers, and their derivatives, C30-45 alkyl cetearyl dimethicone crosspolymer, cetearyl dimethicone crosspolymer, copolymers, and their derivatives, dimethicone/phenyl vinyl dimethicone crosspolymer, vinyl dimethicone/lauryl dimethicone crosspolymer, copolymers, and their derivatives and mixtures thereof.

12. The oil in water emulsion of any of the preceding claims, further comprising a silicone elastomer which is an emulsifying elastomers that is preferably selected from the group consisting of polyoxyethylene silicone elastomer, polyglycerin-modified silicone elastomers, alkyl-containing polyoxyethylene silicone elastomers, alkyl-containing polyglycerin-modified silicone elastomers, polyoxypropylene silicone elasotmer, and mixtures thereof.

13. The oil in water emulsion of any of the preceding claims, wherein the emulsion is a personal care composition selected from the group consisting of a skin care composition, anti-perspirant, deodorant, cosmetic, hair colorant, a sun screen, a moisturizer, conditioner, anti-aging compound, skin lightener, sunless tanner, shave preparation, after-shave, foundation, lipstick, hair styling product, shampoo, cleanser, and combinations thereof.

14. The oil in water emulsion of any of the preceding claims, wherein the personal care composition is a fluid, a solid, a gel, a stick, a aerosol, a foam, and mixtures thereof.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/047431

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/365 A61K8/368 A61K8/73 A61Q17/04 A61K8/06
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

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00/56270 A2 (UNILEVER PLC [GB]; UNILEVER NV [NL]; LEVER HINDUSTAN LTD [IN]) 28 September 2000 (2000-09-28) example 4	1-5,8,9, 13,14
X	FR 2 782 269 A1 (OREAL [FR]) 18 February 2000 (2000-02-18) claims 1, 12, 14-15 page 4, line 1 - line 11 page 6, line 5 - line 14	1,2,13, 14
X	WO 2013/083913 A2 (SEPPIC SA [FR]) 13 June 2013 (2013-06-13) claims 1, 9 page 15, line 3 - page 17, line 23	1-14

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2014	24/11/2014

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
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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	KOKINI J L ET AL: "Storage stability of model sucrose or salt added O/W emulsions through steady shear and creep rheological measurements", JOURNAL OF FOOD PROCESSING AND PRESERVATION, TRUMBULL, CT, US, vol. 12, 1 January 1989 (1989-01-01), pages 293-308, XP002523713, DOI: 10.1111/J.1745-4549.1989.TB00087.X the whole document	1-14
A	FR 2 944 458 A1 (ECOLE DE BIOLOG IND EBI [FR]) 22 October 2010 (2010-10-22) claims 1-10 page 3, line 9 - line 14	1-14

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/047431

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0056270 A2	28-09-2000	AR 023093 A1	04-09-2002
		AT 431129 T	15-05-2009
		AU 2911100 A	09-10-2000
		CA 2363688 A1	28-09-2000
		CN 1350449 A	22-05-2002
		EP 1169015 A2	09-01-2002
		EP 2020228 A2	04-02-2009
		EP 2022483 A1	11-02-2009
		EP 2022484 A2	11-02-2009
		ES 2324328 T3	05-08-2009
		JP 4585125 B2	24-11-2010
		JP 2002539229 A	19-11-2002
		TW 555564 B	01-10-2003
		US 6440432 B1	27-08-2002
		WO 0056270 A2	28-09-2000
		ZA 200107195 A	30-08-2002
FR 2782269 A1	18-02-2000	AT 220536 T	15-08-2002
		BR 9903434 A	26-09-2000
		CA 2279722 A1	17-02-2000
		CN 1245054 A	23-02-2000
		DE 69902131 D1	22-08-2002
		DE 69902131 T2	07-11-2002
		EP 0987011 A1	22-03-2000
		ES 2181376 T3	16-02-2003
		FR 2782269 A1	18-02-2000
		JP 3595206 B2	02-12-2004
		JP 2000063263 A	29-02-2000
		KR 20000017297 A	25-03-2000
		US 6281203 B1	28-08-2001
WO 2013083913 A2	13-06-2013	CN 103987372 A	13-08-2014
		EP 2787961 A2	15-10-2014
		FR 2983722 A1	14-06-2013
		KR 20140105729 A	02-09-2014
		WO 2013083913 A2	13-06-2013
FR 2944458 A1	22-10-2010	FR 2944457 A1	22-10-2010
		FR 2944458 A1	22-10-2010