Title of the Invention: **Polymer-containing composition and method thereof**

Abstract Title: **Sunscreen composition comprising a hydrophilic dendrimer and a film forming polymer**

A composition comprising: (a) a sunscreen agent, (b) a hyperbranched or dendrimer hydrophilic polymer, (c) a film forming polymer different from (b), and wherein the composition comprises a polar solvent present at up to 95 wt% of the composition. The composition may be used in cosmetic topical applications or sun care applications.
POLYMER-CONTAINING COMPOSITION AND METHOD THEREOF

TECHNICAL FIELD

The disclosed technology relates to a composition comprising: (a) a sunscreen agent, (b) a hyperbranched or dendrimer hydrophilic polymer, (c) a film forming polymer different from (b), and wherein the composition comprises a polar solvent present at up to 95 wt % of the composition. The disclosed technology further relates to the use and method of the disclosed technology in cosmetic applications or sun care applications.

BACKGROUND OF THE INVENTION

Sun care products are applied to skin to form a coating/film. However, the coating/film is susceptible to stresses and rubbing, or contact with other bodies/surfaces e.g., washed off by water. The result of these changes is believed to have impact on the amount of sunscreen agent retained on the skin. With stresses and/or rubbing sunscreen agent is believed to have a tendency to wear away because it is less resistant to changes in stresses and rubbing. Consequently with increased wear away, or washing off, the coating of the skin with a sun care composition is reduced and a loss of performance occurs.

Hyperbranched or dendritic polymers are known in personal care formulations such as hair care products as described in US2011/0293552 (published 1 December 2011, Derici et al.), US7914773 (published 29 March, 2011, Derici et al.) and US2014/0348771 (published 27 November 2014, Beumer et al.). In contrast to cosmetic compositions, none of the hair care products such as shampoo and conditioner remain in contact with skin for a prolonged period of time as they are washed off during use.

A number of sun care compositions are disclosed in the following publications:

US2008/081025 (published 3 April 2008, Schlifkeposchalko et al.) discloses a cosmetic composition comprising a conjugate comprising a hyperbranched polymer covalently bonded to at least three UV absorbing chromophores having an UV absorption maximum lambda max of at least ≥270 nm.

US2013/022560 (published 24 January 2013, Schlifkeposchalko) relates to a UV filter obtained by a process that prepared hyperbranched polyether-polyol followed by a partial or total etherification with 3-[1-(4-Hydroxymethyl-phenyl)-meth-(E)-yldene]-1,7,7-trimethyl-bicyclo [2.2.1] heptan-2-one.
US2014/178318 (published 26 June 2014, Janssen et al.) relates to a UV filter obtained by a process that prepared hyperbranched polyether-polyol followed by esterifying 30-80% of hydroxyl groups with 2-(4-Diethylamino-2-hydroxybenzoyl)benzoic acid.

US2012/0282201 (published 8 November 2012, Schliekeposchakko) relates to a UV filter obtained by a process that prepared hyperbranched polyether-polyol followed by a partial or total esterification of the hydroxyl groups with a p-alkoxyacrylic acid of a defined formula.

US2012/0288456 (published 15 November 2012, Schliekeposchakko) relates to a UV filter obtained by a process that prepared hyperbranched polyether-polyol followed by a partial or total, esterification of the hydroxyl groups with 2-cyano-3,3-diphenylacrylic acid.

US2013034511 (published 7 February 2013, Schliekeposchakko) relates to a UV filter obtained by a process that prepared hyperbranched polyether-polyol followed by a partial or total esterification of the hydroxyl groups with p-dimethylamino benzoic acid.

US2014/0093459 (published 3 April 2014, Schliekeposchakko) relates to a method to enhance solubility of butyl methoxydibenzoylmethane and/or bis-ethylhexyloxyphenol methoxyphenyl triazine in a cosmetic oil suitable as a solvent for butyl methoxydibenzoylmethane and/or bis-ethylhexyloxyphenol methoxyphenyl triazine, which method comprises incorporating a solubility enhancing effective amount in a cosmetic oil suitable as a solvent for butyl methoxydibenzoylmethane and/or bis-ethylhexyloxyphenol methoxyphenyl triazine of a polyglycerol based UV filter obtained by a process comprising a UV filter obtained by a process that prepared hyperbranched polyether-polyol followed by a and 2-(4-diethylamino-2-hydroxybenzoyl)benzoic acid.

SUMMARY OF THE INVENTION

It would be advantageous to have a composition that may be applied topically to provide the benefit of spreadability without losing UV absorbance. In addition, the composition disclosed herein may have of increased rub (or wear) resistance, and/or increased coating flexibility.

As used herein, the transitional term "comprising," which is synonymous with "including," "containing," or "characterized by," is inclusive or open-ended and does not exclude additional, un-recited elements or method steps. However, in each recitation of
"comprising" herein, it is intended that the term also encompass, as alternative embodiments, the phrases "consisting essentially of and "consisting of," where "consisting of excludes any element or step not specified and "consisting essentially of permits the inclusion of additional un-recited elements or steps that do not materially affect the basic, essential and novel characteristics of the composition, method or use under consideration.

As used herein reference to gel is used in the ordinary sense defined by IUPAC and is intended to include a non-fluid colloidal network or polymer network that is expanded throughout its whole volume by a fluid. The fluid may for instance be water or alcohol.

Unless otherwise indicated concentrations of each ingredient of the composition disclosed herein is on a weight basis relative to the total composition disclosed herein.

Unless otherwise indicated various ingredients disclosed herein may be individual compounds, or in a mixture of compounds.

As used herein reference to skin is intended to include skin that covers the surface of the epidermis or stratum corneum e.g., facial, or body skin.

The disclosed technology relates to a composition comprising:

(a) a pigment,
(b) 0.1 to 10 wt %, or 0.1 to 5 wt % of a hyperbranched or dendrimer hydrophilic polymer,
(c) a film forming polymer different from (b), and

wherein the composition comprises a polar solvent present at up to 95 wt %, or up to 90 wt % of the composition.

In one embodiment the composition disclosed herein is not a hydrogel (as defined by IUPAC as a gel in which the swelling agent is water).

In one embodiment the disclosed technology relate to a method for protecting human skin against the deleterious effects of ultraviolet irradiation, comprising topically applying thereto an effective amount of the composition disclosed herein to skin.

In one embodiment the disclosed technology relates to the use of the composition disclosed as a sun care composition for skin to provide the benefit of spreadability without losing UV absorbance.
The use and method disclosed herein are known to the skilled person as not encompassing therapeutic or medical treatment i.e., the disclosed use or method relate to a non-therapeutic use or method.

5  **DETAILED DESCRIPTION OF THE INVENTION**

The disclosed technology provides a composition, methods and uses as disclosed above.

The personal care compositions such as shampoos, conditions known in the prior art have their compositions in contact with or on the skin for up to a few minutes until being washed off or otherwise removed from skin.

In contrast, the compositions disclosed herein are typically intended to remain in contact with or on skin for a prolonged period of time. For example the compositions disclosed herein may be in contact with or on skin for at least one or two hours. In some instances the composition disclosed herein may be on skin for up to 8, or 4 (or 3) hours as a sun care composition.

**Sunscreen Agent**

The composition disclosed herein comprises a sunscreen agent component. The sunscreen may comprise an organic or inorganic sunscreen agent (may be known as sunscreen filter, or blocker for UVA and/or UVB) or a combination of the two.

When the sunscreen agent is inorganic, it may be a pigment. The pigment (may also be referred to as a SPF enhancer, and typically the particle size of the pigment is finer. Finer particle size allows for the particles to affect light scattering. The sun care SPF enhancer is also the same as listed above for the pigment definition, with black iron oxide, and/or titanium dioxide typical examples.

25 The pigment may be organic or inorganic.

When inorganic, the pigment may be iron oxide, especially red, yellow and black iron oxides, titanium dioxide, zinc oxide, potassium ferricyanide (K3Fe(CN)6), potassium ferrocyanide K4Fe(CN)6.3H2O, or potassium ferrocyanide dehydrate, or an oxide of, zinc, zirconium and/or cerium.

30 In one embodiment the pigment may be black iron oxide, red iron oxide, yellow iron oxide and/or titanium dioxide.
In one embodiment suitable inorganic sunscreen agent may include those chosen from microfine titanium dioxide, and microfine zinc oxide, or boron nitride.

In one embodiment the disclosed technology comprising a sunscreen agent may have the advantage of easier to apply topically as the composition may be more spreadable.

When the pigment is organic, the pigment may be carbon black, an azo compound, xanthene, quinone, FD&C pigment, D&C pigment, or a lake pigment.

A FD&C pigment is known in the art and approved by the Federal Food, Drug and Cosmetic Act (FD&C Act).

A D&C pigment is known in the art and approved by US Food and Drug Administration.

An azo compound is known in the art and relates to a compound having a divalent -N=N- between two carbon atoms.

A lake pigment is known in the art and may be manufactured by precipitating a dye with an inert binder, or mordant, usually a metallic salt. Examples of a lake pigment include aluminum lakes, strontium lakes, or barium lakes.

Examples of FD&C and D&C pigments include Red 6, Red 7, Red 30, Red 34, Yellow 5, Blue 1, or derivatives thereof.

The pigment may be surface treated, often with alkyl silanes, to improve dispersion in a hydrophobic media. The most common pigment surface treatment is triethoxycaprylylsilane.

In one embodiment the sunscreen agent of the disclosed technology may be organic. Suitable organic sunscreen agent include those chosen from: a) p-aminobenzoic acids, their esters and derivatives (for example, 2-ethylhexyl p-dimethylaminobenzoate), b) methoxycinnamate esters (for example, 2-ethylhexyl p-methoxycinnamate, 2-ethoxyethyl p-methoxycinnamate or a, p-di- (p-methoxycinnamoyl)-a'- (2ethylhexanoyl)-glycerin, c) benzophenones (for example oxybenzone), d) dibenzoylmethanes such as 4-(tert-butyl)-4'-methoxydibenzoylmethane, e) 2-phenylbenzimidazole-5 sulfonic acid and its salts, f) alkyl-ss, ss-diphenylacrylates for example alkyl a-cyano-ss, ss-diphenylacrylates such as octocrylene, g) triazines such as 2,4,6-trianilino- (p-carbo-2-ethyl-hexyl-1-oxi)-1,3,5-triazine, h) camphor derivatives such as methylbenzylidene camphor and/or i) methylene bis-benzotriazole tetramethyl butylyphenol ; j) silicone derivatives such as drometrizole
trisiloxane and benzylidene malonate polysiloxane; k) salicylates such as octyl salicylate, or l) mixtures thereof.

The sunscreening agent may for instance be 4-(1,1-dimethylethyl)-4′-methoxydibenzoylmethane (also known as butylmethoxy dibenzoylmethane) or 4-isopropylidibenzoylmethane.

The organic sunscreen agent may for example include butyl methoxydibenzoylmethane (sold commercially as Parsol™1789 or referred to as Avobenzone), diethylhexyl butamido triazone (also known as Iscotrizinol), bis-ethylhexyloxyphenol methoxyphenyl MPT, or bis-ethylhexyloxyphenol methoxyphenyl triazine (also known as bemotrizinol).

Other sunscreen ingredients include those chosen from homosalate, ethylhexyl salicylate, diethylhexylbutamido triazone, bis-ethylhexyloxyphenol methoxyphenyl triazine, diethylamino hydroxybenzoyl hexyl benzoate, butyl methoxydibenzoylmethane, methylene bis-benzotriazoyl tetramethylbutylphenol, Polysilicone-15 and/or mixtures thereof.

In one embodiment the disclosed technology is not a reaction product of hyperbranched or dendrimer hydrophilic polymer and an organic sunscreen agent.

The disclosed technology comprising a sunscreen agent may be a cream, lotion, or spray; and may be aqueous based or anhydrous (water free, but comprising alcohol as polar solvent).

A sunscreen agent may be present from 0.1 to 10 wt %, or 0.5 to 7 wt %, or 1 to 6 wt % of the composition.

**Hyperbranched or Dendrimer Hydrophilic Polymer**

The hyperbranched or dendrimer hydrophilic polymer may be considered as water-soluble. Water soluble is considered to mean at least 0.1 g of hydrophilic polymer is dissolved in 100 mL of water.

Examples of hyperbranched or dendrimer hydrophilic polymer classes include a polyamide, polyethyleneimine, polyesteramide (e.g. commercially sold under Hybran™ S series), polyether (e.g. polyglycerol), polyphosphoester (e.g. polyphosphates and polyphosphonates), polyester (e.g. Boltorn™ H series), polyamidoamine (e.g. PAMAM), polyacrylate and polymethacrylate. The weight average molecular weight of the hydrophilic polymer may range from 500 to 50,000, or 750 to 20,000, or 1000 to 10,000.
Examples of hyperbranched or dendrimer hydrophilic polymer end groups are hydroxyl, amine, carboxylate, phosphate, phosphonate, sulphate, sulphonate, a zwitterionic group (e.g. carboxybetaine, sulfobetaine or phosphorylcholine), or a sugar moieties (e.g. glucose).

In one embodiment the hyperbranched or dendrimer hydrophilic polymer having a weight average molecular weight of greater than 20,000 has a hydrophilic core, and polymer end groups (such as –OH, or –NH₂) have been further reacted with solubilising groups such as ethylene oxide- chains.

In one embodiment the hyperbranched or dendrimer hydrophilic polymer having a weight average molecular weight of 750 to 20,000. Examples of the hyperbranched or dendrimer hydrophilic polymer include a polyamide, polyethyleneimine, polyesteramide (e.g. Hybrane™ S series), polyether (e.g. polyglycerol), or polyphosphoester (e.g. polyphosphates and polyphosphonates).

In one embodiment the hyperbranched or dendrimer hydrophilic polymer may include a polyesteramide (e.g. Hybrane™ S series) and/or a polyether (e.g. polyglycerol).

The polyesteramide may be a condensation polymer containing ester groups and at least one amide group in the backbone, having at least one hydroxylalkylamide end group and having a weight average molecular mass of greater than 800 g/mol.

The polyesteramide may be prepared by a process comprising reacting a cyclic anhydride with an alkanolamine to form a hydroxylalkylamide, after which the polymer is obtained through polycondensation.

Alternatively, the polyesteramide may be prepared by a process comprising reacting alkanolamine with a compound containing an acid group and an activated acid group, after which the polymer is obtained through polycondensation.

Alternatively, the polyesteramide may be prepared by a process comprising reacting a cyclic anhydride with an alcohol after which the reaction product obtained reacts in situ with an alkanolamine and the polymer is subsequently obtained through polycondensation.

The alkanolamine may be an alkyl-substituted p-hydroxyalkylamide such as (di)isopropanolamine, 1-(m)-ethylisopropanolamine, (di)isobutanolamine, cyclohexylisopropanolamine, di-cyclohexanolamine and/or n-butylisopropanolamine.

A more detailed description of the polyesteramide is presented in WO99/16810 (published 8 April, 1999, Van Benthem et al.), for example see claims 1 to 16 of
WO99/16810; and Examples I to IV on page 29 line 26 to page 32, line 26 for outline of the synthesis of representative examples of the polyesteramide.

In one embodiment the polyesteramide is unmodified i.e., the polyesteramide does not react with a monomer, oligomer, or polymer containing reactive groups that can react with a hydroxyalkylamide. In one embodiment the polyesteramide may be a polymer from claims 1-14 of WO99/16810.

The polyether may be homopolymer or copolymer. The homopolymer may be polyglycerol formed via ring-opening multibranched polymerization of glycidol (see for example disclosure in *Macromolecules*, 1999, 32 (13), pp 4240–4246, DOI: 10.1021/ma990090w). A copolymer may include copolymers of glycidol and one or more of ethylene oxide and propylene oxide or other epoxides.

The polyether may be a homopolymer or copolymer. The homopolymer may be formed by polymerising ethylene oxide. A copolymer may include copolymers of ethylene oxide and one or more of propylene oxide and butylene oxide. The resultant copolymer may be a random or block copolymer having hyperbranched or dendrimer architecture.

The hyperbranched or dendrimer hydrophilic polymer disclosed herein may have a weight average molecular weight of 500 to 50,000, or 750 to 20,000, or 1000 to 10,000. The weight average molecular weight may be determined using size exclusion chromatography techniques and using a polymethyl methacrylate standard.

The composition disclosed herein may comprise 0.2 to 8.5 wt %, or 0.5 to 7 wt %, or 1 to 5 wt %, or 1.5 to 3 wt % of the hyperbranched or dendritic polymer. In one embodiment the hyperbranched or dendrimer hydrophilic polymer may be solubilised in the polar solvent.

**Film-Forming Polymer**

The film forming polymer is a different polymer to the hyperbranched or dendrimer hydrophilic polymer disclosed herein.

The film-forming polymer may be silicon-containing or non-silicon containing.

In one embodiment the film forming polymer may be non-silicon containing.

In one embodiment the film forming polymer may be silicon containing.

In one embodiment the non-silicon containing film forming polymer may include synthetic gum, natural gum, synthetic polymer, natural polymer, polysaccharide thickening agent, associative thickener, anionic associative rheology modifier, nonionic associative...
rheology modifier, acrylates/C10-30 alkylacrylate crosspolymer, acrylates/aminoacrylates/C10-30 alkyl PEG-20 itaconate copolymer, acrylates copolymer, acrylates/steareth-20 methacrylate copolymer, acrylates/beheneth-25 methacrylate copolymer, PEG-150/decyl alcohol/SMDI copolymer, PVP (polyvinylpyrrolidone homopolymer or copolymer e.g., alkylated polyvinylpyrrolidone), PVM/MA decadiene crosspolymer, carbomer, PEG crosspolymer, acrylates/palmeth-25 acrylates copolymer, polysaccharide, polyacrylate, polyether-1, sodium magnesium silicate, sodium carbomer, sodium polyacrylate, sodium polymethacrylate, sodium polyacryloyldimethyl taurate, sodium acryloyldimethyl taurate copolymer, sodium carragenan, sodium carboxymethyl dextran, hydroxyethylcellulose, hydroxypropyl cyclodextran, bentonites, trihydroxystearin, aluminum-magnesium hydroxide stearate, or xanthan gum, isoprene/MA/methoxy PEG-40 copolymer, VA/butyl maleate/isobornyl acrylate copolymer, dimethylacrylamide/acrylic acid/polystyrene/ethyl methacrylate copolymer, acrylates/octylacrylamide copolymer, polyvinyl alcohol, VP/hexadecane copolymer, polybutene, polybutene, polyurethane, acrylate/octylacrylamide copolymer, adipic acid/diethylene glycol/glycerine crosspolymer, or trimethylpentanediol/adipic acid/glycerin crosspolymer.

In one embodiment the film forming polymer may include polyvinyl alcohol, VP/hexadecene copolymer, alkylated polyvinylpyrrolidone, acrylates copolymer, acrylates/octylacrylamide copolymer, polybutene, adipic acid/diethylene glycol/glycerin crosspolymer, trimethylpentanediol/adipic acid/glycerin crosspolymer, or polyurethane.

In one embodiment the silicon-containing film-forming polymer may include a silicone acrylate copolymer or a silicone gum or resin or elastomer, such as butyl acrylate/hydroxypropyl dimethicone acrylate copolymer, acrylate/polytrimethyl siloxymethacrylate, isobutylmethacrylate/bis-hydroxypropyl dimethicone acrylate copolymer, acrylates/polytrimethylsiloxymethacrylate copolymer, dimethiconol, divinyl dimethicone/dimethicone copolymer, trimethylsiloxysilicate, polysilsesquioxane or trimethylsiloxysilicate/dimethiconol crosspolymer.

The film forming polymer may be present at 0.01 to 60 wt %, or 0.03 to 30 wt % of the composition.

The film forming polymer may be present at 0.05 to 10 wt %, or 0.05 to 5 wt %, or 1 to 3 wt % of the composition.
Polar Solvent

The polar solvent is a cosmetically acceptable medium, or a skin care acceptable medium.

The polar solvent may include water, or an alcohol having 1 to 4 (or 2 to 3) carbon atoms. Examples of suitable alcohols include ethanol, propanol or iso-propanol.

In one embodiment the polar solvent is water; and in another embodiment the polar solvent is ethanol.

Other Ingredients

The composition disclosed herein may optionally further comprise other ingredients.

The other ingredients include, an antioxidant, a skin conditioning agent, a salicylic acid compound, preservatives and/or gelling agents sequestering agents, wax, diluents, carriers, propellants perfumes, or pH adjusting agents.

The antioxidant polyphenolic agents may include extracts from plants chosen from Mulberry (e.g. morus alba), Ginseng (e.g. Panax ginseng), Raspberry, Oregano (e.g. origanum vulgare), Green tea (e.g. green leaves of camellia sinensis), White tea (e.g. camellia sinensis), Blueberry extract (e.g. vaccinium cyanococcus), French maritime pine bark (e.g. pinus pinaster, sold under the tradename Pycnogenol), Rosemary (e.g. rosmarinus officinalis), Grape, including grape seed (e.g. vitis vinifera), Fennel (e.g. foeniculi fructus), Caragana sinica, Marjoram (e.g. origanum majorana), Crocus (e.g. crocus sativus), Apple (e.g. malus domestica), Coffee, Green coffee, Cherry (e.g. prunus avium), Snow algae (e.g. chlamydomonas nivalis), Emblica (e.g. Phyllanthus emblica), Gingko (e.g. Gingko biloba), Moringa (e.g. moringa oleilera), Ginger (e.g. zingiberaceae), Magnolia (e.g. magnoliioideae virginiana), French saffron, Edelweiss (e.g. leontopodium alpinium), White lotus (e.g. nymphæa alba), Turmeric root, Marshmallow (e.g. althaea officianlis), Burdock (e.g. arctium lappa), Bilberry (e.g. vaccinium myrtillus), Cranberry (e.g. vaccinium oxyccoccus), Pomegranate nectar (e.g. Punica granatum), Sage (e.g. salvia officinalis), Thyme (e.g. thymus vulgaris), Sunflower (e.g. helianthus annuus), wild carrot (e.g. daucus carota), Hop (e.g. humulus lupulus), Witch Hazel (e.g. hamamelis), Oak (e.g. Quercus), Camellia (e.g. theacea), Red clover (e.g. tritolum pratense), Flax (e.g. linium usitatissimum), lemon (e.g. citrus limon), birch (e.g. betula), cornflower, (e.g. centaurea cyanus), geranium, polygonum, or soy (e.g. glycine max).
The amounts of antioxidant plant polyphenolic agents used in the present invention are expressed as dry weights of the extract, as understood by a man skilled in the art. When present the antioxidant (plant extract) may be present at 0.005 to 10 wt%, or 0.01 to 7 wt%, or 0.01 to 5 wt% of the composition.

5 **Skin Conditioning Agent**

The composition of the present invention may optionally comprise a skin conditioning agent. The skin conditioning agents may be chosen from humectants, emollients, moisturisers, or mixtures thereof. Where present, the skin conditioning agent may be present from 0 or 0.01 to 20 wt%, or 0.1 to 10 wt%, or 0.5 to 7 wt% of the composition.

The skin conditioning agents may be chosen from guanidine, urea, glycolic acid and glycolate salts, salicylic acid, lactic acid and lactate salts, aloe vera, shea butter, polyhydroxy alcohols, such as sorbitol, mannitol, xylitol, erythritol, glycerol, hexanetriol, butanetriol, (di) propylene glycol, butylene glycol, hexylene glycol, polyethylene glycol, sugars (e.g. fructose, glucose, xylose, honey, mannose, xylose), gluconodeltalactone, and starches and their derivatives, pyrrolidone, carboxylic acid, hyaluronic acid and salts thereof, lactamide monoethanolamine, acetamide monoethanolamine, panthenol, or allantoin.

In one embodiment the skin conditioning agent may be chosen from glycerine, arabinogalactan, butylene glycol, hyaluronic acid, shea butter, propylene glycol, ethylhexyl glycerine, or hyaluronate.

**Salicylic Acid Compound**

The compositions disclosed herein may optionally comprise a salicylic acid compound, its esters (such as alkylated salicylate e.g., octyl salicylate), its salts, or combinations thereof. In one embodiment of the composition disclosed herein comprises a salicylic acid compound at 0 or 0.0001 to 25 wt%, or 0.001 to 15 wt%, or 0.01 to 10 wt%, or 0.1 to 5 wt%, or 0.01 to 2 wt% of the composition, of salicylic acid. In one embodiment the salicylic acid compound is salicylic acid or octyl salicylic acid.

**Other Optional Ingredients**

Preservatives may be added to the composition such as benzoic acid, sodium benzoate, sorbic acid, potassium sorbate, 2-bromo2-nitropropane-1,3-diol (bronnopol, which is available commercially under the trade name Myacide ®, benzyl alcohol, diazolidinyl urea, imidazolidinyl urea, methyl paraben, phenoxyethanol, ethyl paraben, propyl paraben,
sodium methyl paraben, sodium dehydroacetate, polyhexamethylenebiguanide hydrochloride, isothiazolone and sodium propyl paraben, suitably in an amount of from 0.01 to 10 wt % of the composition.

Sequestering agents may be added to the composition, such as ethylenediamine tetraacetic acid and salts thereof, for example in an amount from 0 or 0.005 to 0.5 wt % of the composition.

The composition may also comprise suitable, cosmetically acceptable diluents, carriers and/or propellants such as dimethyl ether. The composition may also include pearling agents such as stearic monoethanolamide and/or mica, suitably in an amount of from 0 or 0.01 to 10 wt % of the composition.

Perfumes may be added suitably in an amount of from 0 or 0.01% to 2 wt % of the composition, as may water soluble dyes such as tartrazine, suitably in an amount of from a trace amount such as 0 or 1x10^-5 to 0.1 wt % of the composition.

The composition may also include pH adjusting agents such as sodium hydroxide, amino methyl propanol, triethanolamine, suitably in an amount of from 0 or 0.01 % to 10 wt % of the composition. The composition may be buffered by means well known in the art, for example by use of buffer systems comprising succinic acid, citric acid, lactic acid, and acceptable salts thereof, phosphoric acid, mono-or disodium phosphate and sodium carbonate. Suitably, the composition may have a pH between 3 and 10, between 4 and 8, or between 4.5 and 6.5.

A thickener, viscosity modifying agent and/or gelling agent may be added to the composition in addition to the film forming polymer, and the hyperbranched or dendrimer hydrophilic polymer disclosed herein. The thickener, viscosity modifying agent and/or gelling agent such as acrylic acid polymers e. g. available commercially under the trade name Carbopol® or Ultrez® (both Lubrizol), or a taurate copolymer such as acryloyl methyl taurate-vinylpyrrolidone copolymers, alkylated polyvinylpyrrolidone copolymers (such as Anatron™V220) or hydroxyethylacrylate/sodium acryloyldimethyl taurate copolymers, or modified celluloses e. g. hydroxyethylcellulose available commercially under the trade name Natrosol® (Hercules) or hydroxypropylmethyl cellulose, amine oxides, block polymers of ethylene oxide and propylene oxide (for example, those available from BASF Wyandotte under the trade name"Pluronic"®), PVM, MA, or a decadiene crosspolymer (available under the trade name Stabilez® 60), ethoxylated fatty alcohols, salt (magnesium chloride, sodium
chloride), Aristoflex® AVC (Clariant), phthalic acid amide, xanthan gum, starch, or modified starch (such as a metal salt of starch e.g., aluminum salt of the reaction product of 1-octenylsuccinic anhydride with starch), sodium polyacrylate, polyvinyl alcohols, fatty alcohols and alkyl galactmanans available under the trade name N-Hance® from Hercules.

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Emulsion

The emulsion disclosed herein may be a water-in-oil, oil-in-water, or water-in-silicone composition, often an oil-in-water composition.

The emulsion may be an oil-in-water emulsion, or a water-in-silicone oil emulsion, often an oil-in-water emulsion.

The emulsion may comprise an oil phase and have a polar solvent content of 30 to 85 wt %, or 50 to 80 wt %, or 60 to 75 wt % of the composition.

The polar solvent may contain water present at 40 to 80 wt %, or 50 to 75 wt %, or 60 to 75 wt % of the composition.

The emulsion may comprise an oil phase having 15 to 70 wt %, or 30 to 50 wt %, or 25 to 40 wt % of the composition.

The emulsion may be an oil-in-water composition comprising 15 to 70 wt % of an oil phase; and 30 to 85 wt % of an aqueous phase.

The emulsion may be an oil-in-water composition comprising 25 to 40 wt % of an oil phase; and 60 to 75 wt % of an aqueous phase.

The emulsion may be in the form of a water-in-silicone emulsion, and the water phase may be present at 30 to 85 wt % of an aqueous phase; and silicone present at 15 to 70 wt % of a silicone phase.

The emulsion may be in the form of a water-in-silicone emulsion, and the water phase may be present at 60 to 75 wt % of an aqueous phase; and silicone present at 25 to 40 wt % of a silicone phase.

An oil-in-water or water-in-oil emulsion may comprise an organic oil. The organic oil may be volatile or non-volatile. The organic oil may include a diluent, a solvent, a polyolefin polymer, or an ester oil.

The term "ester oil" means an oil that is liquid at room temperature (25 °C.) comprising at least one ester functional group. The ester oil used herein is chosen, for example, from monoesters.
The ester oil may, for example, be chosen from the monoesters of formula $R^1$COOR$^2$ wherein $R^1$ may be selected from linear and branched hydrocarbon-based chains comprising from 4 to 30, or 6 to 24, or 7 to 20 carbon atoms carbon atoms, and $R^2$ may be chosen from branched hydrocarbon-based chains comprising from 3 to 40 carbon atoms, such as from 10 to 30 carbon atoms and further such as from 16 to 26 carbon atoms.

Examples of the ester oils that may be mentioned include isodecyl neopentanoate; isocetyl octanoate; isononyl isononanoate, isodecyl isononanoate, tridecyl isononanoate; hexyl laurate, 2-hexyldecayl laurate; isopropyl myristate, isocetyl myristate, isotridecyl myristate, 2-octyldodecyl myristate; isopropyl palmitate, 2-ethylhexyl palmitate, isoctyl palmitate, isocetyl palmitate, isodecyl palmitate, isoctearyl palmitate, 2-octyldecayl palmitate; isopropyl isostearate, 2-octyldodecyl stearate, isoctearyl isostearate, and 2-octyldodecyl erucate.

The ester oil may be present in the emulsion disclosed herein in an amount ranging, for example, from 0 to 20 wt %, or 0.1 to 15 wt %, or 1 to 10 wt % of the composition.

**EXAMPLES**

**Study - Sun Lotion**

Each of the following O/W emulsion sun care examples has a base formulation containing octyl salicylate, shea butter, silicone fluid, tribehenin, diethylhexyl butamido triazine, bis-ethylhexyloxyphenol methoxyphenyl triazine, octocrylene, butylene glycol, denatured ethanol, polyglyceryl-3 methylglucose distearate, potassium cetyl phosphate, acrylicates/C10-30 alkyl acrylate crosspolymer, phenoxyethanol, triethanolamine, water and 4.8 wt % of butyl methoxydibenzoylmethane.

**Comparative Example 1 (CE1):** comprises 11.1 wt % of C12-15 alcohols benzoate, 58.1 wt % water, and 2 wt % of hyperbranched polymer (Hybrane™S1200).

**Comparative Example 2 (CE2):** comprises 11.1 wt % of C12-15 alcohols benzoate, 55.1 wt % water, and 5 wt % of hyperbranched polymer (Hybrane™S1200).

**Inventive Example 1 (EX1):** comprises 9.2 wt % of C12-15 alcohols benzoate, 58.1 wt % water, 2 wt % of hyperbranched polymer (Hybrane™S1200), and 1.9 wt % of alkylated polyvinylpyrrolidone copolymer.

**Comparative Example 3 (CE3):** comprises 9.2 wt % of C12-15 alcohols benzoate, 60.1 wt % water, and 1.9 wt % of alkylated polyvinylpyrrolidone copolymer.
**Comparative Example 4 (CE4):** comprises 11.1 wt % of C12-15 alcohols benzoate, and 60.1 wt % water.

**Testing**

Each example is evaluated for viscosity using a rotational viscometer (Brookfield LVDV-I) at 23°C. Each example is also evaluated for UV absorbance. The viscosity and UV absorbance measurements obtained are presented below. Typically better results are obtained for examples with a lower viscosity (suggesting the example is more spreadable), and higher UV absorbance.

A SPF tester system is calibrated and optimised to ensure the maximum signal over the required 290 to 400 nm wavelength range, according to the operation manual. A polymethylmethacrylate (PMMA) plate with a homogeneous layer of isopropyl myristate is scanned as a reference to determine 100% transmission of UV light (290 nm-400 nm). 22.5 mg of the product is applied and is spread evenly over a total area of 22.5 cm². The sample is left to dry for 15 minutes prior to scanning. The plate with sunscreen on is then scanned in 9 different locations. A scan consists of UV transmission measurements taken at 5nm increments from 290 to 400 nm. Transmission readings are converted to absorbance units. Three different plates were used for each product, and the average is reported below for each:

<table>
<thead>
<tr>
<th></th>
<th>CE1</th>
<th>CE2</th>
<th>CE3</th>
<th>CE4</th>
<th>EX1</th>
</tr>
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<tbody>
<tr>
<td>Viscosity (cP)</td>
<td>48,340</td>
<td>30,543</td>
<td>15,547</td>
<td>9,048</td>
<td>12,197</td>
</tr>
<tr>
<td>UV absorbance (355 nm)</td>
<td>1.30</td>
<td>1.11</td>
<td>1.03</td>
<td>0.93</td>
<td>1.10</td>
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The results above indicate that EX1 has the benefit of providing spreadability without losing UV absorbance compared to CE1 to CE4.
CLAIMS

We claim:

1. A composition comprising:

(a) a sunscreen agent,

(b) 0.1 to 10 wt %, or 0.1 to 5 wt % of a hyperbranched or dendrimer hydrophilic polymer,

(c) a film forming polymer different from (b), and

wherein the composition comprises a polar solvent present at up to 95 wt %, or up to 90 wt % of the composition.

2. The composition claim 1, wherein the polar solvent is water, or an alcohol having 1 to 4 or 2 to 3 carbon atoms.

3. The composition of claim 2, wherein the alcohol is ethanol, propanol or iso-propanol.

4. The composition of any preceding claim, wherein the polar solvent comprises 0.2 to 8.5 wt %, or 0.5 to 7 wt %, or 1 to 5 wt %, or 1.5 to 3 wt % of the hyperbranched or dendritic polymer.

5. The composition of any preceding claim, wherein the sunscreen agent is chosen from: a) p-aminobenzoic acids, their esters and derivatives (for example, 2-ethylhexyl p-dimethylaminobenzoate), b) methoxycinnamate esters (for example, 2-ethylhexyl p-methoxycinnamate, 2-ethoxyethyl p-methoxycinnamate or a, p-di- (p-methoxycinnamoyl)-a'- (2ethylhexanoyl)-glycerin, c) benzophenones (for example oxybenzone), d) dibenzoylmethane such as 4-(tert-butyl)-4'-methoxydibenzoylmethane, e) 2-phenylbenzimidazole-5 sulfonic acid and its salts, f) alkyl-ss, ss-diphenylacrylates for example alkyl a-cyano-ss, ss-diphenylacrylates such as octocrylene, g) triazines such as 2,4,6-trianilino- (p-carbo-2-ethyl-hexyl-1-oxi)-1,3,5-triazine, h) camphor derivatives such as methylbenzylidene camphor and/or i) methylene bis-benzotriazole tetramethyl
butylphenol; j) silicone derivatives such as drometrizole trisiloxane and benzylidene malonate polylsiloxane; k) salicylates such as octyl salicylate, or l) mixtures thereof.

6. The composition of any preceding claim 1 to 4, wherein the sunscreen agent is butyl methoxydibenzoylmethane, diethylhexyl butamido triazine, bis-ethylhexyloxyphenol methoxyphenyl MPT, or bis-ethylhexyloxyphenol methoxyphenyl triazine.

7. The composition of any preceding claim, wherein the sunscreen agent is present at 0.1 to 10%, or 0.5 to 7 wt % of the composition.

8. The composition of any preceding claim, wherein the hyperbranched or dendrimer hydrophilic polymer has a weight average molecular weight of 500 to 50,000, or 750 to 20,000, or 1000 to 10,000.

8. The composition of any preceding claim, wherein the hyperbranched or dendrimer hydrophilic polymer is chosen from a polyamide, polyethyleneimine, polyesteramide, polyether, polyphosphateester, polyester, polyamidoamine, polyacrylate and/or polymethacrylate.

9. The composition of any preceding claim, wherein the hyperbranched or dendrimer hydrophilic polymer is a polyesteramide or a polyether.

10. The composition of any preceding claim, wherein the film forming polymer is present at 0.05 to 10 wt % of the composition.

11. A method for protecting human skin against the deleterious effects of ultraviolet irradiation, comprising topically applying thereto an effective amount of the composition of any preceding claim 1 to 10 to skin.

12. The use of the composition of any preceding composition claim 1 to 10 as a sun care composition for skin providing the benefit of spreadability without losing UV absorbance.
Patents Act 1977
Corrected Search Report under Section 17

Documents considered to be relevant:

<table>
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<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
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<tr>
<td>X</td>
<td>1-12</td>
<td>US2013/0022560 A1 (SCHLIFKEPOSCHALKO) See the Example Gels and Sprays of Page 7 and 8</td>
</tr>
<tr>
<td>X</td>
<td>1, 2, 5, 7-10</td>
<td>WO2007/98888 A1 (DSM IP ASSETS) See Examples 25, 30, 33 and page 13 line 25-page 15 line 33</td>
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<tr>
<td>X</td>
<td>1-3, 8a, 9-12</td>
<td>WO2011/078408 A1 (DOW CORNING TORAY) See Example 4</td>
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Categories:

- X Document indicating lack of novelty or inventive step
- Y Document indicating lack of inventive step if combined with one or more other documents of same category.
- & Member of the same patent family
- A Document indicating technological background and/or state of the art.
- P Document published on or after the declared priority date but before the filing date of this invention.
- E Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:
Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

- Worldwide search of patent documents classified in the following areas of the IPC
  - A61K

The following online and other databases have been used in the preparation of this search report:
- EPODOC, WPI

International Classification:

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