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(71) Applicant (for all designated States except US): ISP INVESTMENTS INC. [US/US]; 1011 Centre Road, Suite 315, Wilmington, DE 19805 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): BARRETT, Christine, M. [US/US]; 30 Powder Mill Lane, Oakland, NJ 07436 (US). ROSS, Tracey [US/US]; 11 Awosting Road, Hewitt, NJ 07421 (US). GUERRERO, RitaMarie [US/US]; 7 Skyview Terrace, Morris Plains, NJ 07950 (US). HOOD, David, K. [US/US]; 20 Concord Lane, Basking Ridge, NJ 07920 (US). FARES, Hani [US/US]; 1 Rue Matisse, Somerset, NJ 08873 (US).

(74) Agents: DAVIS, William, J. et al.; International Specialty Products, Legal Department Building 8, 1361 Alps Road, Wayne, NJ 07470 (US).

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(54) Title: SUN-CARE COMPOSITIONS

(57) Abstract: A sun-care composition having an SPF value of at least (15) containing (a) one or more sun-care actives; (b) a copolymer (or a terpolymer) containing (A) at least one vinyl pyrrolidone monomer and (i) at least one vinyl caprolactam monomer or (ii) at least one vinyl acetate monomer or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer; and (c) a pharmaceutically/cosmetically/dermatologically acceptable vehicle.

## SUN-CARE COMPOSITIONS

### CROSS REFERENCE TO RELATED APPLICATION

**[0001]** This application claims the benefit of U.S. Provisional Application Serial No. 61/231,855 filed August 6, 2009, the entire contents of which are hereby incorporated by reference.

### BACKGROUND

**[0002]** The present application relates to a sun-care composition having an SPF value of at least 15 comprising: (a) one or more sun-care actives; (b) a copolymer (or a terpolymer) containing (A) at least one vinyl pyrrolidone monomer and at least one vinyl caprolactam monomer or at least one vinyl acetate monomer or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer; and (c) a cosmetically/dermatologically acceptable vehicle. The sun-care actives include UV-A and/or UV-B sunscreens or mixtures thereof.

**[0003]** More particularly, the present application relates to sunscreen compositions that provide a boost in the SPF value of the composition and provide enhanced sensory properties when applied. Thus, the present application describes compositions that provide efficient photo protection and that can be applied in a smooth, continuous film over the skin which leaves the skin feeling soft and silky.

**[0004]** UV radiation is part of the electromagnetic (light) spectrum that reaches the earth from the sun. It has wavelengths shorter than visible light, making it invisible to the naked eye. These wavelengths are classified as UVA, UVB, or UVC, with UVA the longest of the three at 320–400 nanometers (nm, or billionths of a meter). UVB ranges from 290 to 320 nm. With even shorter rays, most UVC is absorbed by the ozone layer and does not reach the earth.

**[0005]** Sunlight or ultraviolet radiation in the UV-B range is known to be the primary cause of sunburn whereas UV-A radiation, which makes up 90% of solar radiation produces tanning of the skin. However, in that process, UV-A rays cause, in particular, a loss in the elasticity of the skin and the appearance of wrinkles, promoting a premature aging thereof.

**[0006]** Besides the immediate malady of sunburn, excessive sunlight exposure can lead to skin disorders. For instance, prolonged and constant exposure to the sun may lead to actinic keratoses and carcinomas. Another long-term effect is premature aging of the skin. This condition is characterized by skin that is wrinkled, cracked and has lost its elasticity.

**[0007]** Sunscreen compositions are applied to the skin to protect the skin from the sun's ultraviolet rays. Over the past 10 years, awareness of the detrimental effects of unprotected UV exposure has increased and, as a result, consumers are seeking higher levels of protection. Further the standards of the sunscreens have been raised by stringent testing requirements by Regulatory authorities. The most significant changes within these regulations are the new requirements for UVA protection and the added test for photostability of finished sunscreen formulations. The majority of sun-care products currently require SPF levels of at least 30, reaching upwards of 50+. As a result, high levels of UVA protection are required in order to make a UVA claim.

**[0008]** As the sun-care market is becoming more competitive, companies are separating themselves from competitors by launching higher SPF products and thus claiming higher UV protection. To achieve protection across a wide range, sunscreen makers may include several different sunscreen ingredients. One of the most opted way of achieving higher SPF values, is to increase the amount of sunscreens in the product. This approach however will increase the cost of the product and might negatively impact the sensory characteristics of the product. Others have added small amounts of UV absorbers like butyl octyl salicylate as boosters to formulations. Others increased SPF by adding light scattering/refracting polymers to the product such as styrene/acrylates copolymers.

**[0009]** Among the most desirable options is finding a number of absorbers that work in synergy or by using various polymers that provide a continuous film on the skin. A wide variety of cosmetic/dermatological compositions intended for the enhanced performance of sunscreens of human skin is known in the art.

**[0010]** U.S. Pat. No. 6,436,376 discloses a regime/regimen for improved UV-photoprotecting human skin, hair and/or scalp against the deleterious effects of ultraviolet irradiation, comprising topically applying thereon (a) an effective UV-photoprotecting amount of at least one UV-A and/or UV-B sunscreen and (b) an amount of the copolymer

tricontanyl PVP (Ganex- WP-660). The compositions are said to be particularly effective for the sunscreen avobenzene.

**[0011]** Similarly, US Pat. No. 6,436,377 claims a regime/regimen for improved UV-photoprotecting human skin, hair and/or scalp against the deleterious effects of ultraviolet irradiation, comprising applying thereon at least one UV-A and/or UV-B sunscreen and the interpolymer PVP/dimethiconylacrylate/polycarbamyl/polyglycol ester in an amount effective to significantly enhance the SPF value.

**[0012]** US Pat. No. 7,368,105 discloses photoprotective compositions comprising at least one dibenzoylmethane UV-screening agent, a stabilizing admixture comprising arylalkyl benzoate compound and at least one bis-resorcinyll triazine compound.

**[0013]** US Pat. No. 4,524,061 discloses polymeric sunscreen agents comprising interpolymers of (a) an olefinic p-aminobenzoate devoid of hydroxy substitution; (b) N-vinylpyrrolidone; (c) a monomer selected from the group consisting of a vinyl lactam having a number average molecular weight of at least 125, an acrylate or methacrylate or any mixture thereof and optionally (d) acrylic or methacrylic acid.

**[0014]** Further, US Pat. No. 5,916,541 discloses a waterproof sunscreen and insect repellent stable emulsion composition comprising an emulsifying agent for forming a stable emulsion; and a film forming agent present in an amount effective to form a thin film when the composition is applied to the skin of a person and provides SPF factors of about 2 to about 50. Poly (vinyl pyrrolidone/1-triacontene) is specifically disclosed.

**[0015]** A consumer consideration while purchasing a sunscreen product is how the product feels and how well it spreads over the skin. Typically, consumers want a sunscreen that feels soft and silky and can be applied in a smooth, continuous film over the skin. Ultimately, product feel could determine whether the consumer decides to purchase the product.

**[0016]** US Pat. No. 7,416,719 describes a sunscreen composition comprising: (a) at least one sunscreen agent; and (b) at least one lauryl glucoside emulsifier, wherein the lauryl glucoside emulsifier imparts an enhanced soft, silky feel to the composition.

[0017] With such an advancement and awareness among the consumer, it is always and foremost desired to have sunscreens formulated with the goal of inhibiting skin damage from the sun's rays. The sunscreen composition filters or blocks the harmful UV-A and UV-B rays that can damage and harm the skin. Thus, the present application discloses sun-care compositions with enhanced performance and aesthetics.

#### SUMMARY

[0018] The present application discloses sun-care compositions comprising one or more sun-care actives in combination with specific polymers derived from vinyl lactams. In accordance with certain embodiments, the compositions exhibit enhanced/elevated efficiency of the sunscreen active. The compositions of the invention provide the user with an enhanced soft, silky feel when applied to skin while still providing superior protection from damaging ultraviolet light.

[0019] In accordance with certain aspects of the present invention, there is provided a sun-care composition comprising one or more sun-care actives in combination with specific polymers derived from vinyl lactams which are capable of enhancing/elevating the efficiency of the sunscreen.

[0020] In accordance with particular aspects, the present application discloses sun-care composition having an SPF value of at least 15 comprising:

- (a) one or more sun-care actives;
- (b) a copolymer (or a terpolymer) containing the residue of (A) at least one vinyl pyrrolidone monomer and (i) at least one vinyl caprolactam monomer or (ii) at least one vinyl acetate monomer or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer; and
- (c) a pharmaceutically/cosmetically/dermatologically acceptable vehicle.

[0021] The sun-care active can be selected from the group consisting of UV-A sunscreens, UV-B sunscreens, physical sun blockers and combinations thereof. The sun-care composition of the present invention typically has an SPF of at least 15, more particularly about 25, and in certain cases from about 50 to about 130.

**[0022]** In a particular embodiment, the copolymer (or a terpolymer) containing at least one vinyl pyrrolidone monomer and at least one vinyl caprolactam monomer can be selected from the group consisting of vinyl pyrrolidone/vinyl caprolactam/dimethylaminoethylmethacrylate (DMAEMA) (available from ISP under the brand name of Advantage® S, Advantage® HC-37, Advantage® LC-E), vinyl pyrrolidone/vinyl caprolactam/dimethylaminopropylmethacrylamide (DMAPMA) acrylate (available from ISP under the brand name of Aquaflex® SF-40), vinyl pyrrolidone/vinyl caprolactam/dimethylaminopropylmethacrylamide acrylate/methacryloylaminopropyl lauryldimoniumchloride (available from ISP under the brand name of Aquastyle® 300) and vinyl pyrrolidone/vinyl caprolactam (available from BASF under the brand name Luvitec55K, 65W).

**[0023]** In another embodiment of the present invention the copolymer containing at least one vinyl pyrrolidone monomer or at least one vinyl caprolactam monomer and at least one vinyl acetate monomer contains units derived from vinyl pyrrolidone and vinyl acetate present in a ratio from about 70:30 to about 30:70 (available from ISP under various brands PVP/VA-S-630, PVP/VA-735, PVP/VA-635, PVP/VA-535, PVP/VA-335).

**[0024]** The one or more sun-care actives can be used in an amount from about 1 wt. % to about 50 wt. % of the total weight of the composition. The copolymer (or terpolymer) may be used from about 0.05 wt. % to about 10 wt. % of the total weight of the composition, more preferably, from about 0.5 wt. % to about 2 wt. % of the total weight of the composition.

**[0025]** The pharmaceutically/cosmetically/dermatologically acceptable vehicle is well known to those skilled in the art and includes a cream, a lotion, an emulsion, an oil, a spray, a gel, a aerosol, an aqueous or hydra-alcoholic solution, a suspension, an anhydrous solution, a serum, an ointment, a gel, or a paste.

**[0026]** The sun-care composition of the present invention can further comprise one or more additional components selected from the group consisting of skin-feel additives, moisturizing agents, film former/waterproofing agents, pH adjuster/chelating agents, emulsifiers, preservatives, anti-aging agents, skin whitening agents, exfoliating agents, treatment ingredients, fragrances and mixtures thereof.

**[0027]** The sun-care composition in a preferred embodiment is in the form of an oil-in-water emulsion, a water-in-oil emulsion, an oil-water-oil emulsion, a water-oil-water emulsion, a water-in-silicone emulsion, an oily solution, a lipid fusion, a hydro-alcoholic gel, an anhydrous gel, an aqueous gel, an alcoholic solutions or a hydro-alcoholic solution.

**[0028]** This invention also provides a method for enhancing the SPF-value of one or more sun-care actives in UV-photoprotecting sun-care compositions comprising admixing and intimately formulating the pharmaceutically/cosmetically/dermatologically acceptable carrier and a copolymer or terpolymer comprising (A) at least one vinyl pyrrolidone monomer and (i) at least one vinyl caprolactam monomer or (ii) at least one vinyl acetate monomer or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer in an amount effective to enhance the SPF value of said one or more sun-care actives.

#### DETAILED DESCRIPTION

**[0029]** The present invention relates to a SPF enhanced sun-care composition comprising one or more sun-care actives, a copolymer (or a terpolymer) and a pharmaceutically/cosmetically/dermatologically acceptable vehicle. The copolymer (or a terpolymer) comprises (A) at least one vinyl pyrrolidone monomer and (i) at least one vinyl caprolactam monomer or (ii) at least one vinyl acetate monomer or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer.

**[0030]** While applicants do not wish to be bound by any theories, it is believed that the mechanism of enhancement of SPF is generally attributed to the ability of the polymer to make a uniform film of the product onto the skin. The distribution of the sunscreen actives in the film is considered key to the boosting the effect of such polymer. In addition, the uniformity of the film is also of great importance. Since the surface of the skin is really not very uniform, many polymers do not have the ability of forming continuous films on the skin. That is why not all film formers are considered SPF boosters. The ability to identify such classes of polymers is of key value to formulation chemists as it allows them to achieve higher SPF values with less sunscreen in their formulations. Thus, spreadability, dispersability, uniformity, solubility and compatibility of the selective film polymers as

described in the present invention are factors that can lead to the elevated SPF of the sunscreens desired by the present day customers.

**[0031]** The sunscreen composition of the present invention is uniquely formulated to provide an elevated SPF and enhanced feeling of softness and silkiness when the sunscreen composition is applied to the skin. Moreover, the composition is capable of being easily and uniformly applied over the skin. These enhanced properties are achieved, in large part, by formulating the sunscreen composition as described herein.

**[0032]** According to the present invention, the one or more sun-care actives may be selected from the group consisting of UV-A sunscreens, UV-B sunscreens, physical sun blockers and combinations thereof.

**[0033]** Examples of various UV-A or UV-B sunscreens include p-aminobenzoic acid and its derivatives, anthranilates, benzophenones, camphor derivatives, cinnamic derivatives, dibenzoyl methanes, beta,beta-diphenylacrylate derivatives, salicylic derivatives, triazine derivatives, benzimidazole compounds, bis-benzoazolyl derivatives, methylene bis-(hydroxyphenylbenzotriazole) compounds, sunscreen polymers, silicones, and mixtures thereof.

**[0034]** Examples of physical sun blockers include cerium oxides, chromium oxides, cobalt oxides, iron oxides, red petrolatum, silicone-treated titanium dioxides, titanium dioxides, zinc oxides, and/or zirconium oxides and mixtures thereof.

**[0035]** In a certain embodiment, the sun-care active can be selected from the group consisting of p-aminobenzoic acid, oxyethylene (25 mol) p-aminobenzoate, 2-ethylhexyl p-dimethylaminobenzoate, ethyl N-oxypropylene p-aminobenzoate, glycerol p-aminobenzoate, 4-isopropylbenzyl salicylate, 2-ethylhexyl 4-methoxycinnamate, methyl diisopropylcinnamate, isoamyl 4-methoxycinnamate, diethanolamine 4-methoxycinnamate, 3-(4'-trimethylammunium)-benzyliden-bornan-2-one methylsulfate, 2-hydroxy-4-methoxybenzophenone, 2-hydroxy-4-methoxybenzophenone-5-sulfonate, 2,4-dihydroxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxybenzophenone, 2-hydroxy-4-n-octoxybenzophenone, 2-hydroxy-4-methoxy-4'-methoxybenzophenone, .beta.(2-oxoborn-3-ylidene)-tolyl-4-sulfonic acid and soluble salts thereof, 3-(4'-sulfo)benzyliden-bornan-2-one and soluble salts thereof, 3-



(4'-methylbenzylidene)-d,1-camphor, 3-benzylidene-d,1-camphor, benzene 1,4-di(3-methylidene-10-camphosulfonic) acid, urocanic acid, 2,4,6-tris[p-(2'-ethylhexyl-1'-oxycarbonyl)-anilino]-1,3,5-triazine, 2-[(p-(tert-butylamido)anilino)-4,6-bis-[(p-(2'-ethylhexyl-1'-oxycarbonyl) anilino)-1,3,5-triazine, 2,4-bis {[4-(2-ethyl-hexyloxy)]-2-hydroxy]-phenyl}-6-(4-methoxyphenyl)-1,3,5-triazine, N-(2 et 4)-[(2-oxoborn-3-yliden)methyl]benzyl]-acrylamide, 1,4-bisbenzimidazolyl-phenylene-3,3',5,5'-tetrasulfonic acid, the benzalmalonate-substituted polyorganosiloxanes, the benzotriazole-substituted polyorganosiloxanes (Drometrizole Trisiloxane), dispersed 2,2'-methylene-bis-[6-(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol], solubilized 2,2'-methylene-bis-[6-(2H-benzotriazol-2-yl)-4-(methyl)phenol], cerium oxides, chromium oxides, cobalt oxides, iron oxides, red petrolatum, silicone-treated titanium dioxide, titanium dioxides, zinc oxides, and/or zirconium oxides and acid, salts, esters, derivatives and any combinations thereof.

**[0036]** The amount of sun-care active employed will depend on the level of protection desired. Although not to be construed as limiting, compositions will typically contain sun-care active in the range of about 1 wt. % to about 50 wt. % of the total weight of the composition. The amount of sunscreen agent in the composition will vary in the above range depending on the sun protection factor (SPF) desired. The higher the SPF, the greater the total amount of sunscreen agent used. In accordance with certain embodiments, the composition contains more than one sunscreen agent.

**[0037]** The term "SPF number" used in connection with the present invention refers to the dose required to produce a minimal erythema on protected skin, divided by the dose required to produce the same degree of skin erythema without the product applied.

$$\text{SPF} = \frac{\text{minimal erythema dose (MED) on protected skin}}{\text{MED on unprotected skin}}$$

**[0038]** The sun-care composition of the present invention should provide an SPF value of at least 15. More particularly, it should provide an SPF of at least 25 and in another particular embodiment of the invention provides an SPF of from about 50 to about 130.

**[0039]** The term copolymer (or a terpolymer) used in connection with the present invention refers to polymers/copolymers/terpolymers of vinyl pyrrolidones, capable of enhancing the SPF value to at least 15 and more particularly from about 50 to about 130 and also forming a uniform smooth continuous film over the skin surface to provide complete protection.

**[0040]** In a particular embodiment, the copolymer (or a terpolymer) comprising at least one vinyl pyrrolidone monomer and at least one vinyl caprolactam monomer is selected from the group consisting of vinyl pyrrolidone/vinyl caprolactam/dimethylaminoethylmethacrylate (DMAEMA) (available from ISP under the brand name of Advantage® S, Advantage® HC-37, Advantage® LC-E), vinyl pyrrolidone/vinyl caprolactam/dimethylaminopropylmethacrylamide (DMAPMA) (available from ISP under the brand name of Aquaflex® SF-40), vinyl pyrrolidone/vinyl caprolactam/dimethylaminopropylmethacrylamide(DMAPA)/methacryloylaminopropyl lauryldimoniumchloride (available from ISP under the brand name of Aquastyle® 300).

**[0041]** In one particular embodiment, the copolymer (or a terpolymer) comprises at least one vinyl pyrrolidone monomer and at least one vinyl acetate monomer present in a weight ratio from about 70:30 to about 30:70 (available from ISP under various brands such as PVP/VA-S-630, PVP/VA-735, PVP/VA-635, PVP/VA-535, PVP/VA-335). Molecular weights for some specific examples are provided below:

<b>Polymer</b>	<b>Typical Molecular Weight</b>
E335	28,800
E535	36,700
E635	38,200
E735	56,700
I335	12,700
I535	19,500

Polymer	Typical Molecular Weight
I735	22,300

**[0042]** In another embodiment, the copolymer or terpolymer comprises at least one vinyl caprolactam monomer and at least one vinyl acetate monomer.

**[0043]** The amount of copolymer (or terpolymer) in the present invention typically ranges from about 0.05 wt. % to about 10 wt. % of the total weight of the composition. More particularly it may range from about 0.5 wt. % to about 2 wt. % of the total weight of the composition.

**[0044]** While the molecular weight of the polymer is not believed to be critical to the practice of this invention, good results have been achieved using polymers having a molecular weight from about 5,000 to 100,000, and more particularly from about 10,000-65,000. Molecular weight in g/mol may be based on weight average molecular weight determined by methods, such as light scattering, known to those of ordinary skill in the art.

**[0045]** Examples of pharmaceutically/cosmetically/dermatologically acceptable vehicles include a cream, a lotion, an emulsion, an oil, a spray, a gel, a aerosol, an aqueous or hydra-alcoholic solution, a suspension, an anhydrous solution, a powder, a serum, an ointment, a gel, or a paste.

**[0046]** The amount of cosmetically acceptable vehicle in the present composition will vary considerably based upon product form, but typically will range from about 30 wt % to about 99.95 wt % and preferably about 50 wt % to about 99 wt %, based upon the total weight of the composition.

**[0047]** In a particular embodiment, the sun-care composition further comprises one or more additional components selected from the group consisting of skin-feel additives, moisturizing agents film former/waterproofing agents, pH adjuster/chelating agents, emulsifiers, preservatives, anti-aging agents, skin whitening agents, exfoliating agents, treatment ingredients, fragrances and mixtures thereof.

[0048] The composition can be made into any suitable product form. Such product forms include, but are not limited to, an aerosol, balm, cream, gel, lotion, mousse, patch, pomade, pump spray, roll-on, solution, stick or towelette.

[0049] In a particular embodiment, the present composition may be formulated in the form of an emulsion. The emulsion may be, for example, anhydrous, an oil-in-water emulsion, a water-in-oil emulsion, an oil-water-oil emulsion, a water-oil-water emulsion, a water-in-silicone emulsion, an oily solution, a lipid fusion, a hydro-alcoholic gel, an anhydrous gel, an aqueous gel, an alcoholic solutions or a hydro-alcoholic solution.

[0050] The sunscreen compositions may be prepared by using techniques and methods well known in the art. In general, ingredients are incorporated by mixing and applying heat if necessary, until the composition is uniform and homogeneous. The composition may be homogenized to ensure homogeneity and to build the proper viscosity. The sunscreen compositions of the present invention typically are then packaged in any package or container suitable for a sunscreen composition.

[0051] In another particular embodiment of the present invention, there is provided a method for enhancing the SPF-value of one or more sun-care actives in UV-photoprotecting sun-care compositions comprising admixing and intimately formulating the pharmaceutically/cosmetically/dermatologically acceptable carrier and a copolymer (terpolymer) comprising at least (A) one vinyl pyrrolidone monomer and (i) at least one vinyl caprolactam monomer or (ii) at least one vinyl acetate monomer in an amount effective to enhance the SPF value of said one or more sun-care actives or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer.

[0052] The sunscreen composition of the present invention is uniquely formulated to provide an enhanced feeling of softness and silkiness when the sunscreen composition is applied to the skin. Moreover, the composition is capable of being easily and uniformly applied over the skin.

[0053] The following examples further illustrate the invention.

INCI Name	77-1	79-4	141-1	77-2	145-2	145-4	148-7	148-6	145-5	145-6
	A	B	C	D	E	F	G	H	I	J
Avobenzone	2.0	2.0	2.0	3.0	3.00	3.00	2.0	2.0	2.0	2.0
Homosalate	7.0	7.0	7.0	8.0	8.00	8.00	7.0	7.0	7.0	7.0
Octisalate	5.0	5.0	5.0	4.0	4.00	4.00	5.0	5.0	5.0	5.0
Octinoxate	7.5	7.5	7.5				7.5	7.5	7.5	7.5
Benzophenone-3	3.0	3.0	3.0	5.0	5.00	5.00	3.00	3.0	3.0	3.0
Octocrylene				2.35	2.35	2.35				
Aquaflex SF-40								1.5	0.5	1.5
Advantage S							0.5		0.5	0.5
PVP/VA E535		1.0								
PVP/VA S630			1.0			1.00				
PVP/VA E735					1.00					
Ethanol	QS	QS	QS	QS	QS	QS	QS	QS	QS	QS
Percent Boost	N/A	43.16	74.9	N/A	24.05	30.84	45.67	26.34	57.18	47.5

INCI Name	60-2 K	60-1 L	95-2 M	10-2 N	141-2 O	95-1 P	142-4 Q
<b>Phase A</b>							
Deionized water	QS	QS	QS	QS	QS	QS	QS
Disodium EDTA	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Glycerin	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Acrylates/C10-30 alkyl acrylate crosspolymer	0.30	0.30	0.30	0.30	0.30	0.30	0.30
<b>Phase B</b>							
Sodium lauryl lactylate (and) Cetearyl alcohol (and) glyceryl Stearate	1.25	1.25	1.25	1.25	1.25	1.25	1.25

<b>INCI Name</b>	<b>60-2 K</b>	<b>60-1 L</b>	<b>95-2 M</b>	<b>10-2 N</b>	<b>141-2 O</b>	<b>95-1 P</b>	<b>142-4 Q</b>
Behenyl alcohol	0.50	0.50	0.50	0.50	0.50	0.5	0.50
Ceteareth 20	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Diisopropyl adipate	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Avobenzone	3.00	2.00	2.00	3.00	2.00	2.00	3.00
Homosalate	8.00	7.00	7.00	8.00	7.00	7.00	8.00
Octisalate	4.00	5.00	5.00	4.00	5.00	5.00	4.00
Octinoxate		7.50	7.50		7.50	7.50	
Benzophenone-3	5.00	3.00	3.00	5.00	3.00	3.00	5.00
Octocrylene	2.35			2.35			2.35
Aquaflex SF-40					0.50	1.50	0.50
Advantage S					0.50	0.50	0.50
PVP/VA E535							
PVP/VA S630			1.00				
PVP/VA E735				1.00			
<b>Phase C</b>							
Triethanolamine	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Propylene glycol (and) diazolidinyl urea (and) methylparaben (and) propylparaben	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Boost	N/A	N/A	24.66	25.51	34.11	39.70	43.49

**[0054]** The invention has been described in detail with particular reference to particular embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

What is claimed is:

1. A sun-care composition having an SPF value of at least 15 comprising:
  - (a) one or more sun-care actives;
  - (b) a copolymer (or a terpolymer) containing (A) at least one vinyl pyrrolidone monomer and (i) at least one vinyl caprolactam monomer or (ii) at least one vinyl acetate monomer or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer; and
  - (c) a pharmaceutically/cosmetically/dermatologically acceptable vehicle.
2. The composition according to claim 1, wherein the sun-care active is selected from the group consisting of UV-A sunscreens, UV-B sunscreens, physical sun blockers and combination thereof.
3. The composition according to claim 1, wherein the sun-care active is selected from the group consisting of p-aminobenzoic acid, oxyethylene (25 mol) p-aminobenzoate, 2-ethylhexyl p-dimethylaminobenzoate, ethyl N-oxypropylene p-aminobenzoate, glycerol p-aminobenzoate, 4-isopropylbenzyl salicylate, 2-ethylhexyl 4-methoxycinnamate, methyl diisopropylcinnamate, isoamyl 4-methoxycinnamate, diethanolamine 4-methoxycinnamate, 3-(4'-trimethylammunium)-benzyliden-bornan-2-one methylsulfate, 2-hydroxy-4-methoxybenzophenone, 2-hydroxy-4-methoxybenzophenone-5-sulfonate, 2,4-dihydroxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxybenzophenone, 2-hydroxy-4-n-octoxybenzophenone, 2-hydroxy-4-methoxy-4'-methoxybenzophenone, .beta.(2-oxoborn-3-ylidene)-tolyl-4-sulfonic acid and soluble salts thereof, 3-(4'-sulfo)benzyliden-bornan-2-one and soluble salts thereof, 3-(4'methylbenzylidene)-d,1-camphor, 3- benzylidene-d,1-camphor, benzene 1,4-di(3-methylidene-10-camphosulfonic) acid, urocanic acid, 2,4,6-tris[p-(2'-ethylhexyl-1'-oxycarbonyl)-anilino]-1,3,5-triazine, 2-[(p-(tertiobutylamido)anilino)-4,6-bis-[(p-(2'-ethylhexyl-1'-oxycarbonyl) anilino)-1,3,5-triazine, 2,4-bis {[4-(2-ethyl-hexyloxy)]-2-hydroxy]-phenyl}-6-(4-methoxyphenyl)-1,3,5 -triazine, N-(2 et 4)-[(2-oxoborn-3-ylidene)methyl]benzyl]-acrylamide, 1,4-bisbenzimidazolyl-phenylen-3,3',5,5'-tetrasulfonic acid, the benzalmalonate-substituted polyorganosiloxanes, the benzotriazole-substituted polyorganosiloxanes (Drometrizole Trisiloxane), dispersed 2,2'-methylene-bis-[6-(2H-

benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol], solubilized 2,2'-methylene-bis-[6-(2H-benzotriazol-2-yl)-4-(methyl)phenol, cerium oxides, chromium oxides, cobalt oxides, iron oxides, red petrolatum, silicone-treated titanium dioxide, titanium dioxide, zinc oxide, and zirconium oxide and acid, salts, esters, derivatives and combinations thereof.

4. The composition according to claim 1, having an SPF of at least about 25.
5. The composition according to claim 1, wherein the copolymer (or terpolymer) contains at least one vinyl pyrrolidone monomer and at least one vinyl caprolactam monomer.
6. The composition according to claim 1, wherein the copolymer (or terpolymer) contains at least one vinyl pyrrolidone monomer and at least one vinyl acetate monomer.
7. The composition according to claim 1, wherein said one or more sun-care actives are present in an amount of about 1 wt. % to about 50 wt. % of the total weight of the composition.
8. The composition according to claim 1, wherein said copolymer (or terpolymer) is about 0.05 wt. % to about 10 wt. % of the total weight of the composition.
9. The composition according to claim 8, wherein said copolymer (or terpolymer) is about 0.5 wt. % to about 2 wt. % of the total weight of the composition.
10. The composition according to claim 1, wherein said pharmaceutically/cosmetically/dermatologically acceptable vehicle is selected from the group consisting of a cream, a lotion, an emulsion, an oil, a spray, a gel, a aerosol, an aqueous solution, a hydra-alcoholic solution, a suspension, an anhydrous solution, a powder, a serum, an ointment, a gel, a paste and combinations thereof.
11. The composition according to claim 1, further comprising one or more additional components selected from the group consisting of skin-feel additives, moisturizing agents film former/waterproofing agents, pH adjuster/chelating agents, emulsifiers, preservatives, and mixtures thereof.



12. The sun-care composition according to claim 1 in the form of an oil-in-water emulsion, a water-in-oil emulsion, an oil-water-oil emulsion, a water-oil-water emulsion, a water-in-silicone emulsion, an oily solution, a lipid fusion, a hydro-alcoholic gel, an anhydrous gel, an aqueous gel, an alcoholic solutions or a hydro-alcoholic solution.

13. A method for enhancing the SPF-value of one or more sun-care actives in UV-photoprotecting sun-care compositions comprising admixing and intimately formulating a pharmaceutically/cosmetically/dermatologically acceptable carrier and a copolymer (or terpolymer) comprising (A) at least one vinyl pyrrolidone monomer and (i) at least one vinyl caprolactam monomer or (ii) at least one vinyl acetate monomer or (B) at least one vinyl caprolactam monomer and at least one vinyl acetate monomer in an amount effective to enhance the SPF value of said one or more sun-care actives.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 10/44500

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - A61K 8/00 (2010.01) USPC - 424/59 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - A61K 8/00 (2010.01) USPC - 424/59 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 424/59, 70.12, 60, 400, 401 Non-patent Literature; Patents (key word limited) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST (PGPB, USPT, EPAB, JPAB); Google (Google Scholar, Google Patents) Search Terms Used: sun-care, sunscreen, sunblock, SPF, sun protection factor, actives, copolymer, terpolymer, vinyl pyrrolidone, vinyl caprolactam, vinyl acetate, vinyl lactams, carrier, vehicle, increase, raise, elevate, enhance, emulsion, spray, cream, film former		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,436,376 B1 (HANSENNE, et al.) 20 August 2002 (20.08.2002) col 3, ln 36-45; col 4, ln 43-45, 60-65; col 5, ln 20-67; col 6, ln 1-13, 39-45, 53-58; col 7, ln 8-18, 38-48; col 8, ln 22-26, 33-36; col 9, ln 6-9; col 10, ln 1-2, 45-53, 66-67; col 11, ln 1-2, 20-22; clm 29	1-13
Y	US 2006/0110346 A1 (LU) 25 May 2006 (25.06.2006) para [0044], [0046], [0055], [0060]-[0061]	1-13
Y	US 2008/0317795 A1 (TRAYNOR, et al.) 25 December 2008 (25.12.2008) para [0044], [0156], [0159]-[0160]	5
A	US 2005/0186160 A1 (AUST, et al.) 25 August 2005 (25.08.2005) entire document	1-13
A	US 2006/0013839 A1 (YU) 19 January 2006 (19.01.2006) entire document	1-13
A	US 2005/0079141 A1 (ZANDER, et al.) 14 April 2005 (14.04.2005) entire document	1-13
A	US 6,284,227 B1 (STEWART) 04 September 2001 (04.09.2001) entire document	1-13
A	US 6,436,377 B1 (HANSENNE, et al.) 20 August 2002 (20.08.2002) entire document	1-13
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 09 September 2010 (09.09.2010)		Date of mailing of the international search report <b>17 SEP 2010</b>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774