The compounds of the invention correspond to formula (I) with n = 0 to 5, m = 0 to 5, R1, R2, and R3 independent of each other, selected from H, an alkyl chain of 1 to 6 carbon atoms, an alcohol, alkoxy, amine and substituted amine group, and R4 selected from an alkyl, aryl, aralkyl, acyl, sugar or alkoxyl chain of 1 to 6 carbon atoms, and corresponding amino-acid or peptides derivatives corresponding to the following formula (VI) (Xaa)n entity being either an amino-acid (with p=1) or any peptide having p amino-acids with p between 1 and 10. With the exclusion of the compounds corresponding in formula I to n=3, m=0, R1=H and R2=methyl or ethyl. Preferably n=3 so as to form a geranylgeranyl group. The present invention is also directed to topical compositions comprising compounds of formula I and VI. Such composition can be used in the cosmetrical field to improve the overall appearance/condition of the skin and in dermo-pharmaceutical field to for preventing or treating disorders and diseases of the skin and appendages, in particular for anti aging prevention and treatment by fighting the effects of oxidation, for skin lightening, volumizing by lipofilling, and action on the mechanical skin properties.
NEW POLYTERPENE TYPE COMPOUNDS, COMPOSITIONS CONTAINING THEM AND TOPICAL USES THEREOF

TECHNICAL FIELD
5 The present invention relates to novel compounds of terpenic type, in particular of geranylgeranyl type (including four terpene patterns, also known as isoprene), compositions comprising them and topical uses thereof.

The present invention concerns the chemical, dermo-medical or cosmetical industries for the hygiene and personal care of the skin and appendages (such as hair, eyelashes, eyebrows, nails, hairs) of mammals, animals or humans.

BACKGROUND ART
Geranylgeranyl pattern is coupled to many cellular proteins, regulating their activity as well as addressing them in different cellular compartments. The transfer on the proteins is performed by a geranylgeranyltransferase which ensures the coupling with the energy released during the rupture of the phosphate bond of isoprene skeleton-P04:

Generally, isoprenes have affinities with the protein helical transmembrane parts and promote by their presence the protein-protein interactions by improving their mobility within the membranes. These protein accompanying properties make the geranylgeranyl isoprene in particular a pivot molecule of the cellular function both at the level of the membrane receptors and the level of the functionality of intracellular proteins and of their addressing. It is a sort of physiological facilitator.

Compounds comprising a pattern of geranylgeranyl type have already been proposed and in cosmetics such as:
- Geranylgeraniol in anti-aging, active promoter of collagen synthesis (JP2008 189607) and having the following formula:

This compound is also described in combination with retinol also for anti-aging properties (US5756109).
- Geranyl geranyl acetone called teprenone known for its whitening (EP0561305), anti-aging (EP1879538) and humectant (JP7309710) properties and having the following formula:
The article "Cyclisation of high terpenoids acids and their esters in superacid" in the Journal "Izvestiya Zkademii Nauk, Seriya Khimicheskaya", (1995), (12), 2507-13, discloses the terpenoid compound:

\[
\begin{align*}
\text{GGPM (formula V).}
\end{align*}
\]

Thereafter in the description called the GGPM (formula V).


\[
\begin{align*}
\text{GGPE (formula IV).}
\end{align*}
\]

Thereafter in the description called the GGPE (formula IV).

The present invention aims to propose alternative compounds for cosmetic and pharmacy industries still in demand for new ingredients, including ingredients that may be active on several targets in order to offer a range of complementary activities.

**SUMMARY OF THE INVENTION**

To this end, the present invention proposes polyterpenic compounds corresponding to formula I below:

\[
\begin{align*}
\text{with } n = 0 \text{ to } 5, m = 0 \text{ to } 5, R_i, R_2 \text{ and } R_3, \text{ independently of each other, selected from } H, \text{ an alkyl chain of } 1 \text{ to } 6 \text{ carbon atoms, an alcohol, alkoxy, amine and substituted amine group, and } R_4 \text{ selected from an alkyl, aryl, aralkyl, acyl, sugar or alkoxy chain of } 1 \text{ to } 6 \text{ carbon atoms,}
\end{align*}
\]

and corresponding amino-acid or peptides derivatives corresponding to the following formula VI

\[
\begin{align*}
\text{(Xaa)}_p \text{ entity being either an amino-acid (with } p=1), \text{ or any peptide having } p \text{ amino-acids with } p \text{ between } 1 \text{ and } 10.
\end{align*}
\]

More particularly, the subject matter of the present invention is directed to compounds of formula I and to compounds of formula VI,

with the exclusion in formula I of the compounds corresponding to \(n=3, m=0, R_i=H\) and \(R_4=\text{methyl or ethyl} \) (corresponding to the GGPM and the GGPE).
Preferably \( n=3 \) in formulas I and VI so as to form a geranyl geranyl group.

The present invention also encompasses the chemical analogues of these compounds.

As further detailed in the description, results of *in vitro* tests have been obtained with the compounds of the invention that open a strong potential for applications in cosmetics, nutraceuticals or pharmaceuticals in particular dermatology. "Oleodensifying" properties, an alternative to the "lipofilling", giving volume through the stimulation of adipogenesis and thus allowing compensating subcutaneous volume deficits, depigmenting, anti-oxidant and firming properties were in particular highlighted.

According to other preferred particular features:

- \( m = 0 \text{ or } 1 \); and/or
- \( R_4 \) is an alkyl group of 1 to 6 carbon atoms, in particular preferably ethyl or methyl group; and/or
- \( R_1, R_2 \) and \( R_3 \) are, independently from each others, either a methyl or a hydrogen atom, \( R_2 \) being preferably a methyl.

The invention encompasses in particular the following compounds:

- The *Geranyl Geranyl Ethyl Hexanoate* having the following developed formula II and called thereafter in the description the GGHE:

\[
\begin{align*}
\text{GGHE:} & \\
\text{With } n = 3, m = 0, R_1 = \text{methyl} \text{ and } R_4 = \text{ethyl.}
\end{align*}
\]

- The *Geranyl Geranyl Ethyl Octadienoate* of the following developed formula III and called thereafter in the description the GGOE:

\[
\begin{align*}
\text{GGOE:} & \\
\text{With } n = 3, m = 1, R_1 = \text{H}, R_2 = \text{methyl}, R_3 = \text{H} \text{ and } R_4 = \text{ethyl.}
\end{align*}
\]

Farnesyl type compounds (\( n=2 \)) are also examples within the scope of the present invention.

The manufacturing process can advantageously be based on a Wittig reaction with teprenone and the adequate triphenylphosphine Wittig reagent as starting reagents, as can be seen in the reaction scheme given below, illustrate the GGOE:

\[
\begin{align*}
\text{Formula III - GGOE}
\end{align*}
\]
Other manufacture processes are of course possible.

Advantageously, as mentioned above, the invention compounds can be coupled to a \((\text{Xaa})_p\) entity which is either an amino-acid (with \(p=1\)), or any peptide having \(p\) amino-acids with \(p\) between 2 and 10 in order to obtain compounds of the following developed formula, according to the following reaction scheme:

\[
\begin{align*}
\text{Compounds of the invention (=} \text{formula I}) & \quad \text{Amino acid or peptide} \\
\text{Formula VI}
\end{align*}
\]

with \(p\) comprised between 1 and 10.

The compounds of the invention thus constitute an alternative to conventional lipid chains linked to peptides, as a palmitoyl or elaidoyl chain, whose function is to improve the bioavailability of peptide and its ability to penetrate the skin, and to form a synergy with the coupled peptide activity.

The invention covers peptides consisting of encoded amino acids, natural or unnatural, derivatives and analogs, pure or in mixtures (encoded amino acids: Alanine A Ala, Arginine A Arg, Asparagine A Asn, Aspartate or aspartic acid A Asp, Cysteine C Cys, Glutamate or glutamic acid E Glu, Glutamine G Gin, Glycine G Gly, Histidine H His, Ile Ile Isoleucine, Leucine L Leu, Lysine L Lys, Methionine M Met, Phenylalanine F Phe, Proline P Pro, Serine S Ser, Threonine T Thr, Tryptophan W Trp, Tyrosine Y Tyr, Valine V Val). Are cited for example, without limitation, the amino acids K, T, C, M, MO (methionine whose sulfur is oxidized), M02 (methionine whose sulfur is dioxidized), the dipeptides KT, KC, KP, VW, KK or TT, the tripeptides GHK, GKH, KPK, KMOK, KM02K or KAvaK, the tetrapeptides GQPR, the pentapeptides KTTKS, the hexapeptides GKKTKS, etc.

As for other examples, the peptides of the following peptide formulations can be coupled: Matrixyl\textsuperscript{®} [INCI: Palmitoyl Pentapeptide-3], Matrixyl\textsuperscript{®} 3000 [INCI: Palmitoyl Tetrapeptide-3, Palmitoyl Oligopeptide], Matrixyl\textsuperscript{®} synthet\textsuperscript{®} [Glycerin, Water (Aqua), Hydroxypropyl Cyclodextrin, Palmitoyl Tripeptide-38], Calmosensine\textsuperscript{TM} [INCI: Acetyl Dipeptide-1 Cetyl Ester], Rigin\textsuperscript{TM} [INCI: Palmitoyl Tetrapeptide -7], Procapil\textsuperscript{TM} [INCI: Apigenin, Oleandonic Acid, Biotinoyl Tripeptide-1], Dermayl\textsuperscript{TM} [INCI: Ceramide 2, Palmitoyl Oligopeptide], Volulip\textsuperscript{TM} [INCI: Portulaca Pilosa Extract, Palmitoyl Tripeptide-38], Biopeptide EL\textsuperscript{TM} [INCI: Palmitoyl Oligopeptide], Biopeptide CL\textsuperscript{TM} [INCI: Palmitoyl Oligopeptide], Vexel\textsuperscript{TM} [INCI: Caffeine, Palmitoyl Carnitine] or Bio-Bustyl\textsuperscript{TM} [INCI: Rahnella Soy Protein Ferment, Palmitoyl Oligopeptide] marketed by Sederma; Vialox\textsuperscript{TM} [INCI: Pentapeptide-3], Syn-ake\textsuperscript{TM} [INCI: Dipeptide Diaminobutyroyl Benzylamide Diacetate] or Syn-Coll\textsuperscript{TM}

Beyond ten amino acids, amino acids derivatives or analogs, peptides are generally too bulky for cosmetic applications and too expensive to manufacture. For these reasons, coupled peptide can be limited to n = 6 (hexapeptides).

According to preferred examples, in formula VI:

- \( n = 3, R_1 = \text{methyl}, m = 0 \) and \( R_4 = \text{ethyl}, \) corresponding to the coupling of the GGHE with an amino-acid or a peptide.

- \( n = 3, R_1 = \text{H}, m = 1, R_4 = \text{methyl}, H = \text{ethyl}, \) corresponding to the coupling of the GGOE with an amino-acid or a peptide.

- \( n = 3, R_1 = \text{H}, m = 0 \) and \( R_4 = \text{ethyl}, \) corresponding to the coupling of the GGPE with an amino-acid or a peptide.

- \( n = 3, R_1 = \text{H}, m = 0 \) and \( R_4 = \text{methyl}, \) corresponding to the coupling of the GGPM with an amino-acid or a peptide.

In-vitro test results given in the following detailed description show that the compounds of the invention are more particularly useful for preventing or treating the cutaneous signs of aging, in particular through anti-radical and anti-oxydant actions, protection against UV radiations, improvement of the mechanical properties of skin (elasticity, firmness, compressibility), lightening of the skin and treatment of melanin spots (all indication in relation with the decrease of melanogenesis), and for gaining a "lipofilling" effect (restoring/giving volume by stimulating the expansion of adipose tissue).
The present invention also proposes a topical composition, characterized in that it comprises, in a
physiologically acceptable medium, as active ingredient, an effective amount of one or more
compounds to formula I:

\[ \text{with } n = 0 \text{ to } 5, \text{ and } m = 0 \text{ to } 5, \text{ Ri, R}_2 \text{ and } R_3, \text{ independently of each other, selected from H, an alkyl chain of } 1 \text{ to } 6 \text{ carbon atoms, an alcohol, alkoxy, amine and substituted amine group, and } R_4 \text{ selected from an alkyl, aryl, aralkyl, acyl, sugar or alkoxy chain of } 1 \text{ to } 6 \text{ carbon atoms, and }
\]

and corresponding aminoo-acid or peptides derivatives corresponding to the following formula VI:

\[ \text{(Xaa)}_p \text{ entity being either an amino-acid (with } p=1 \text{) or any peptide having } p \text{ amino-acids with } p \text{ between } 1 \text{ and } 10. \]

Preferably n=3 in formulas I and VI so as to form a geranyl geranyl group.

Such composition can be used in the cosmetical field to improve the overall appearance/condition of the skin and in dermo-pharmaceutical field to for preventing or treating disorders and diseases of the skin and appendages.

According to other preferred particular features:

- \( m = 0 \text{ or } 1; \) and/or
- \( R_4 \) is an alkyl group of 1 to 6 carbon atoms, in particular preferably ethyl or methyl group; and/or
- \( R_1, R_2 \text{ and } R_3 \) are, independently from each others, either a methyl or a hydrogen atom, \( R_2 \) being preferably a methyl.
- \( p \) of \( (\text{Xaa})_p \) entity in formula VI is comprised between 1 and 6.

Examples of compounds that can be used for the composition of the invention are:

The GGHE of formula II mentioned above and corresponding amino acid or peptide derivatives;

The GGOE of formula III mentioned above and corresponding amino acid or peptide derivatives;

The GGPE of formula IV mentioned above and corresponding amino acid or peptide derivatives; or

The GGPM of formula V mentioned above and corresponding amino acid or peptides derivatives.

The present invention is more particularly directed to the use of such composition for the cosmetic non therapeutic treatment of skin conditions to improve the overall appearance of the skin, more particularly for the treatments of the signs of intrinsic and extrinsic skin aging, sagging skin, of loss of skin tone, firmness or elasticity, skin atrophy, loss of dermis and epidermis density, for giving volume to the dermis and epidermis, for the treatment of skin dehydration, hair loss or cellulite, for lightening
the skin, for the treatment of glycation of molecules in the skin, of acne, of skin breakdown due to the effects of oxidation and to treat inflammatory conditions.

In particular in cosmetics, applications can be offered in the ranges of moisturizers, cleansers, anti-aging, antioxidant, protective, restorative (hands, feet, lips), contours (face, eyes, neck, lips), make-up for skin and appendages, including eyelashes, lip products, solar products, remodeling, plumping, swelling (e.g. of the hands, buttocks, bust, breasts), hair products, etc..

According to other advantageous features, the cosmetic or dermopharmaceutical composition of the invention may incorporate one or more additional active ingredients, to provide advantageously a cosmetic or dermopharmaceutical product with a wider range of properties or to enhance the properties of the compounds of the present invention. Additional active ingredients may for example be selected from the lightening, anti-redness, sunscreens, moisturizing, humectants, exfoliating, anti-aging, anti-wrinkle and fine lines, stimulating the collagen and/or elastin synthesis, volumizing, elastic properties improving, anti-acne, anti-inflammatory, anti-oxidants, anti-free radical, depigmenting agents, depilatories, anti-regrowth or promoting the growth agents, peptides, vitamins etc. These active ingredients may be obtained from plant materials such as plant extracts or products from plant cells culture or fermentation.

More specifically, the compound of the invention can be combined with at least one of compounds selected from compounds of vitamin B3, niacinamide compounds like or tocopherol, retinol, hexamidine, a-lipoic acid, resveratrol or DHEA or N-acetyl-Tyr-Arg-O-hexadecyl, Pal-KT, Pal-VGVAPG (SEQ ID NO:1), Pal-KTTKS (SEQ ID NO:2), Pal-GHK, Pal-KM02K and Pal-GQPR (SEQ ID NO:3) peptides, which are active ingredients used in conventional cosmetic or dermopharmaceutical topical compositions.

**DETAILED DESCRIPTION**

The term "physiological medium" means according to the present invention, without limitation, an aqueous or alcoholic solution, a water-in-oil emulsion, an oil-in-water emulsion, a microemulsion, an aqueous gel, an anhydrous gel, a serum, a dispersion of vesicles.

"Physiologically acceptable " means that the disclosed compositions or compounds are suitable for use in contact with mucous membranes, nails, scalp, hairs, hair and skin of mammals and more particularly human without risk of toxicity of incompatibility, instability, allergic response, and others.

When present in a composition, the compound of the invention is present in amounts ranging from 0.000001% to 15% compared to the total weight of the composition, more preferably between 0.0001% and 5%, depending of the destination of the composition and the desired effect more or less pronounced.

All percentages and ratios used herein are by weight of total composition and all measurements are made at 25°C unless it is specified otherwise.

Typically, in a composition of the invention consisting simply of the compound of the invention and of an excipient (the physiologically acceptable medium) used as solubilizer, for example, forming an
"active ingredient" for the future preparation of a cosmetic composition, the amount of the compound will be comprised between 0.005% and 5%.

The choice of the excipient of the composition is made according to the constraints related to the compounds of the invention (stability, solubility, etc.) and if according to the dosage form then considered for the composition.

The compounds of the invention have solubility in water that varies according to their exact chemical nature. Thus the compounds of the invention can be incorporated into compositions using an aqueous solution, and those that are not soluble in water can be solubilized with cosmetically, pharmaceutically or physiologically acceptable conventional solubilizers, for example and without limiting this list: ethanol, propanol, isopropanol, propylene glycol, glycerin, butylene glycol, or polyethylene glycol or any combination. It may also be interesting to dissolve the compounds of the invention using emulsifiers and for example emulsifiers containing phosphorus such as phosphate esters.

Additional ingredients

The CTFA International cosmetic ingredient dictionary & handbook (13th Ed. 2010) (published by the Cosmetic, Toiletry, and Fragrance Association, Inc., Washington, D.C.) describes a non limited wide variety of cosmetic and pharmaceutical ingredients usually used in the skin care industry that can be used as additional ingredients in the compositions of the present invention. Examples of these ingredient classes include, but are not limited to: healing agents, skin anti-aging agents, anti-wrinkle agents, anti-atrophy agents, skin moisturizing agents, skin smoothing agents, antibacterial agents, pesticides anti parasitic agents, antifungal agents, fungicidal agents, fungistatic agents, bactericidal agents, bacteriostatic agents, antimicrobial agents, anti-inflammatory agents, anti-pruriginous agents, external anesthetic agents, antiviral agents, keratolytic agents, free radicals scavengers, antiseborrheic agents, antidandruff agents, the agents modulating the differentiation, proliferation or pigmentation of the skin and agents accelerating penetration, desquamating agents, melanin synthesis stimulating or inhibiting agents, whitening or depigmenting agents, propigmenting agents, self-tanning agents, NO-synthase inhibiting agents, antioxidants, free radical scavengers and/or agents against atmospheric pollution, reactive carbonyl species scavengers, antiglycation agents, tightening agents, agents stimulating the synthesis of dermal or epidermal macromolecules and/or capable of inhibiting or preventing their degradation, such as for example collagen synthesis-stimulating agents, elastin synthesis-stimulating agents, decorin synthesis-stimulating agents, laminin synthesis-stimulating agents, defending synthesis-stimulating agents, chaperone synthesis-stimulating agents, aquaporin synthesis stimulation agents, hyaluronic acid synthesis-stimulating agents, fibronectin synthesis stimulating agents, sirtuin synthesis-stimulating agents, agents stimulating the synthesis of lipids and components of the stratum corneum (ceramides, fatty acids, etc.), agents that inhibit collagen degradation, other agents that inhibit elastin degradation, agents that inhibit serine proteases such as cathepsin G, agents stimulating fibroblast proliferation, agents stimulating keratinocyte proliferation,
agents stimulating adipocyte proliferation, agents stimulating melanocyte proliferation, agents stimulating keratinocyte differentiation, agents stimulating adipocyte differentiation, agents that inhibit acetylcholinesterase, skin relaxant agents, glycosaminoglycan synthesis-stimulating agents, antihyperkeratosis agents, comedolytic agents, antipsoriasis agents, DNA repair agents, DNA protecting agents, stabilizers, anti-itching agents, agents for the treatment and/or care of sensitive skin, firming agents, anti-stretch mark agents, binding agents, agents regulating sebum production, lipolytic agents or agents stimulating lipolysis, anti-cellulite agents, antiperspirant agents, agents stimulating healing, coadjuvant healing agents, agents stimulating reepithelialization, coadjuvant reepithelialization agents, cytokine growth factors, calming agents, anti-inflammatory agents, anesthetic agents, agents acting on capillary circulation and/or microcirculation, agents stimulating angiogenesis, agents that inhibit vascular permeability, venotonic agents, agents acting on cell metabolism, agents to improve dermal-epidermal junction, agents inducing hair growth, hair growth inhibiting or retardant agents, muscle relaxants; antipollution and/or anti-free radical agents; lipolytic agents, venotonic agents, slimming agents, anticellulite agents, agents acting on the microcirculation; agents acting on the energy metabolism of the cells; cleaning agents, hair conditioning agents, hair styling agents, hair growth promoters, sunscreen and/or sunblock compounds, make-up agents, detergents, pharmaceutical drugs, emulsifiers, emollients, antiseptic agents, deodorant actives, dermatologically acceptable carriers, surfactants, abrasives, absorbents, aesthetic components such as fragrances, colorings/colorants, essential oils, skin sensates, cosmetic astringents, anti-acne agents, anti-caking agents, anti foaming agents, antioxidants, binders, biological additives, enzymes, enzymatic inhibitors, enzyme-inducing agents, coenzymes, chelating agents, plant extracts, plant derivatives, plant tissue extracts, plant seed extracts, plant oils, botanicals, botanical extracts, essential oils, marine extracts, agents obtained from a biofermentation process, mineral salts, cell extracts and sunscreens (organic or mineral photoprotective agents active against ultraviolet A and/or B rays), ceramides, peptides, buffering agents, bulking agents, chelating agents, chemical additives, colorants, cosmetic biocides, denaturants, drug astringents, external analgesics, film formers or materials, e.g., polymers, for aiding the film-forming properties and substantivity of the composition, quaternary derivatives, agents increasing the substantivity, opacifying agents, pH adjusters, propellants, reducing agents, sequestrants, skin bleaching and lightening agents, skin tanning agents, skin-conditioning agents (e.g., humectants, including miscellaneous and occlusive), skin soothing and/or healing agents and derivatives, skin treating agents, thickeners, and vitamins and derivatives thereof, peeling agents, moisturizing agents, curative agents, lignans, preservatives, UV absorbers, a cytotoxic, an antineoplastic agent, a fat-soluble active, suspending agents, viscosity modifiers, dyes, nonvolatile solvents, diluents, pearlescent aids, foam boosters, a vaccine, and their mixture.

The additional ingredient can be selected from the group consisting of sugar amines, glucosamine, D-glucosamine, N-acetyl glucosamine, N-acetyl-D-glucosamine, mannosamine, N-acetyl mannosamine, galactosamine, N-acetyl galactosamine, vitamin B3 and its derivatives, niacinamide, sodium
dehydroacetate, dehydroacetic acid and its salts, phytosterols, salicylic acid compounds, hexamidines, dialkanoyl hydroxyproline compounds, soy extracts and derivatives, equol, isoflavones, flavonoids, phytantriol, farnesol, geraniol, peptides and their derivatives, di-, tri-, tetra-, penta-, and hexapeptides and their derivatives, KTTKS (SEQ ID NO:4), Pal-KTTKS (SEQ ID NO:2), carnosine, N-acetyl amino acid compounds, retinoids, retinyl propionate, retinol, retinyl palmitate, retinyl acetate, retinal, retinoic acid, water-soluble vitamins, ascorbates, vitamin C, ascorbic acid, ascorbyl glucoside, ascorbyl palmitate, magnesium ascorbyl phosphate, sodium ascorbyl phosphate, vitamins their salts and derivatives, provitamins and their salts and derivatives, ethyl panthenol, vitamin B, vitamin B derivatives, vitamin B1, vitamin B2, vitamin B6, vitamin B12, vitamin K, vitamin K derivatives, pantothenic acid and its derivatives, pantotheryl ethyl ether, panthenol and its derivatives, dexpanthenol, biotin, amino acids and their salts and derivatives, water soluble amino acids, asparagine, alanine, indole, glutamic acid, water insoluble vitamins, vitamin A, vitamin E, vitamin F, vitamin D, mono-, di-, and tri-terpenoids, beta-ionol, cedrol, and their derivatives, water insoluble amino acids, tyrosine, tryptamine, butylated hydroxytoluene, butylated hydroxyanisole, allantoin, tocopherol nicotinate, tocopherol, tocopherol esters, pal-GHK, phytosterol, hydroxy acids, glycolic acid, lactic acid, lactobionic acid, keto acids, pyruvic acid, phytic acid, lysophosphatidic acid, stilbenes, cinnamates, resveratrol, kinetin, zeatin, dimethylaminoethanol, natural peptides, soy peptides, salts of sugar acids, Mn gluconate, Zn gluconate, particulate materials, pigment materials, natural colors, piroctone olamine, 3,4,4'-trichlorocarbanilide, triclocaran, zinc pyrithione, hydroquinone, kojic acid, ascorbic acid, magnesium ascorbyl phosphate, ascorbyl glucoside, pyridoxine, aloe vera, terpene alcohols, allantoin, bisabolol, dipotassium glycyrrhizinate, glycerol acid, sorbitol acid, pentaerythritol acid, pyrrolidone acid and its salts, dihydroxyacetone, erythrollose, glyceraldehyde, tartaraldehyde, clove oil, menthol, camphor, eucalyptus oil, eugenol, menthol lactate, witch hazel distillate, eicosene and vinyl pyrrolidone copolymers, iodopropyl butylcarbamate, a polysaccharide, an essential fatty acid, salicylate, glycyrrhetinic acid, carotenoids, ceramides and pseudo-ceramides, a lipid complex, oils in general of natural origin such shea butter, apricot oil, onagre oil, prunus oil, palm oil, monoi oil, HEPES, procysteine, O-octanoyl-6-D-maltose, the disodium salt of methylglycinediacetic acid, steroids such as diosgenin and derivatives of DHEA, DHEA or dehydroepiandrosterone and/or a precursor or chemical or biological derivative, N-ethylxocarbonyl-4-para-aminophenol, bilberry extracts; phytohormones; extracts of the yeast Saccharomyces cerevisiae, extracts of algae, extracts of soyabean, lupin, maize and/or pea, alverine and its salts, in particular alverine citrate, extract of butcher's broom and of horse chestnut, and mixtures thereof, a metalloproteinase inhibitor.

Further skin care and hair care active ingredients that are particularly useful can be found in SEDERMA commercial literature and on the website www.sederma.fr.

In any embodiment of the present invention, however, the additional ingredients useful herein can be categorized by the benefit they provide or by their postulated mode of action. However, it is to be
understood that the additional ingredients useful herein can in some instances 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 additional ingredients to that particular application or applications listed.

The following known actives can be mentioned, as examples: betain, glycerol, Actimoist Bio 2™ (Active organics), AquaCacteen™ (Mibelle AG Cosmetics), Aquaphyline™ (Silab), AquaregulK™ (Solabia), Carciline™ (Greentech), Codivanelane™ (Biotech Marine), Dermaflux™ (Arch Chemicals, Inc), Hydra'Flow™ (Sochibo), Hydromoiost L™ (Symrise), RenovHyal™ (Soliance), Seamoss™ (Biotech Marine), Essenskin™ (Sederma), Moist 24™ (Sederma), Argireline™ (trade name of the acetyl hexapeptide-3 of Lipotec), spilanthol or an extract of Acmella oleracea known under the name Gatuline Expression™ (EP 1722864), an extract of Boswellia serrata known under the name Boswellin™, Deepaline PVB™ (Seppic), Syn-AKE™ (Pentapharm), Ameliox™, Bioxilift™ (Silab) or mixtures thereof.

Among other plant extracts which can be combined with the compound of the invention, there may more particularly be mentioned extracts of Ivy, in particular English Ivy (Hedera Helix), of Chinese thorowax (Bupleurum chinensis), of Bupleurum Falcatum, of arnica (Arnica Montana L), of rosemary (Rosmarinus officinalis N), of marigold (Calendula officinalis), of sage (Salvia officinalis L), of ginseng (Panax ginseng), of ginko biloba, of St.-John's-Wort (Hypericum Perforatum), of butcher's-broom (Ruscus aculeatus L), of European meadowsweet (Filipendula ulmaria L), of big-flowered Jarva tea (Orthosiphon Stamininus Benth), of algae (Fucus Vesiculosus), of birch (Betula alba), of green tea, of cola nuts (Cola Nipida), of horse-chestnut, of bamboo, of spadeleaf (Centella asiatica), of heather, of fucus, of willow, of mouse-ear, of escine, of cangzhu, of chrysanthemum indicum, of the plants of the Armeiaca genus, Atractylodis Platicodon, Sinnenomen, Pharbitidis, Flemingia, of Coleus such as C Forskohlii, C blumei, C esquirolii, C scutelloides, C xanthanthus and C, Barbatis, such as the extract of root of Coleus barbatus, extracts of Ballote, of Guioa, of Davallia, of Terminalia, of Barringtonia, of Trema, of antirobia, cecropia, argania, dioscoreae such as Dioscorea opposita or Mexican, extracts of Ammi visnaga, of Centella asiatica and Siegesbeckia, in particular Siegesbeectia orientalis, vegetable extracts of the family of Ericaceae, in particular bilberry extracts (Vaccinium angustifolium) or Arctostaphylos uva ursi, aloe vera, plant sterols (e.g., phytosterol), Manjistha (extracted from plants in the genus Rubia, particularly Rubia Cordifolia), and Guggal (extracted from plants in the genus Commiphora, particularly Commiphora Mukul), kola extract, chamomile, red clover extract, Piper methysticum extract (Kava Kava from SEDERMA (FR 2 771 002 and WO 99 / 25369), Bacopa monieri extract (Bacocalmine™ from SEDERMA, WO 99/40897) and sea whip extract, extracts of Glycyrrhiza glabra, of mulberry, of melaleuca (tea tree), of Larrea divaricata, of Rabdosia rubescens, of euglena gracilis, of Fibraurea recisa Hirudinea, of Chaparral Sorghum, of sunflower extract, of Enantia chlorantha, of Mitracarpe of Spermacoce genus, of Buchu barosma, of Lawsonia inermis L., of Adiantum Capillus-Veneris L., of Chelidonium majus, of Luffa
cylindrical, of Japanese Mandarin (Citrus reticulata Blanco var. unshiu), of Camelia sinensis, of Imperata cylindrical, of Glaucium Flavum, of Cupressus Sempervirens, of Polygonatum multiflorum, of lovelyl hemsleya, of Sambucus Nigra, of Phaseolus lunatus, of Centaurium, of Macrocystis Pyrïfera, of Turnera Diffusa, of Anemarrhena asphodeloides, of Portulaca pilosa, of Humulus lupulus, of Coffea Arabica and of Ilex Paraguariensis.

Extraction from the plant may be performed using conventional engineering such as phenolic extraction, from any part of the plant such as the flower, seed, fruit, root, tubercle, leaf, pericarp and preferably rhizome. The extraction solvents may be selected from amongst water, propylene glycol, butylene glycol, glycerin, PEG-6 caprylic/capric glycerides, polyethylene glycol, methyl and/or ethyl esters, diglycols, cyclical polyols, ethoxylated or propoxylated diglycols, alcohols (methanol, ethanol, propanol, and butanol) or any mixture of these solvents. Plant extracts according to the present invention may also be obtained by other processes such as maceration, simple decoction, lixiviation, reflux extraction, supercritical extraction with CO₂, ultrasound or microwave extraction or counter-current techniques, or by plant cell culture engineering and/or fermentation. This list is not restrictive.

Suitable peptides can include, but are not limited to, di-, tri-, terra-, penta-, and hexa- peptides and derivatives thereof. In one embodiment, the composition comprises from about 1x10⁻⁷% to about 20%, more preferably from about 1x10⁻⁶% to about 10%, even more preferably from about 1x10⁻⁵% to about 5%, by weight of additional peptide.

As used herein, "peptide" refers to peptides containing ten or fewer amino acids and their derivatives, isomers, and complexes with other species such as metal ions (e.g., copper, zinc, manganese, and the like). As used herein, peptide refers to both naturally occurring and synthesized peptides. Also useful herein are naturally occurring and commercially available compositions that contain peptides.

Suitable dipeptides for use herein include but are not limited to Carnosine (beta-AH), YR, VW, NF, DF, KT, KC, CK, KP, KK or TT. Suitable tripeptides for use herein include, but are not limited to RKR, HGG, GHK, GKH, GGH, GHG, KFK, GKX, KPK, KMOX, KM02K or KAvaK. Suitable tetrapeptides for use herein include but are not limited to RSRK (SEQ ID NO: 5), GQPR (SEQ ID NO: 6) or KTFK (SEQ ID NO: 7). Suitable pentapeptides include, but are not limited to KTTKS (SEQ ID NO: 4). Suitable hexapeptides include but are not limited to GKTTKS (SEQ ID NO: 8), VGVAPG (SEQ ID NO: 9) and of the type disclosed in FR 2854897 and US 2004/0120918.

Other suitable peptides for use herein include, but are not limited to lipophilic derivatives of peptides, preferably palmitoyl derivatives, and metal complexes of the aforementioned (e.g., copper complex of the tripeptide His-Gly-Gly). Preferred dipeptide derivatives include N-Palmitoyl-beta-Ala-His, N-Acetyl-Tyr-Arg-hexadecylester (CALMO SENSINE™ from SEDERMA, France, WO 9807744, US 6,372,717). Preferred tripeptide derivatives include N-Palmitoyl-Gly-Lys-His, (Pal-GKH from SEDERMA, France, WO 0040611), Pal-KM02K, a copper derivative of His-Gly-Gly sold commercially as lamin, from Sigma, lipospondin (N-Elaidoyl-Lys-Phe-Lys) and its analogs of
conservative substitution, N-Acetyl-Arg-Lys-Arg-NH2 (Peptide CK+), N-Biot-Gly-His-Lys (N-Biot-
GHK from SEDERMA, WO0058347) and derivatives thereof. Suitable tetrapeptide derivatives for use
herein include, but are not limited to N-palmitoyl-Gly-Gln-Pro-Arg (SEQ ID NO: 3) (from SEDERMA,
France), suitable pentapeptide derivatives for use herein include, but are not limited to N-Palmitoyl-Lys-
Thr-Thr-Lys-Ser (SEQ ID NO: 2) (available as MATRIXYL™ from SEDERMA, France, WO 0015188
and US 6,620, 419) N-Palmitoyl-Tyr-Gly-Gly-Phe-X with X Met (SEQ ID NO: 10) or Leu (SEQ ID
NO: 11) or mixtures thereof. Suitable hexapeptide derivatives for use herein include, but are not limited
to N-Palmitoyl-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) and derivatives thereof.

The preferred compositions commercially available containing a tripeptide or a derivative include
Biopeptide-CL™ by SEDERMA (WO0143701), Maxilip™ by SEDERMA (WO 0143701), Biobustyl™
by SEDERMA. The compositions commercially available preferred sources of tetrapeptides include
RIGIN™ (WO0043417), EYELISS™ (WO03068141), MATRIXYL™ RELOADED, and MATRIXYL
3000™ which contain between 50 and 500 ppm of palmitoyl-Gly-Gln-Pro-Arg (SEQ ID NO: 3), and
carrier, proposed by SEDERMA, France (US2004/0132667).

The following marketed peptides can be mentioned as well as additional active ingredients: Vialox™,
Syn-ake™ or Syn-ColI™ (Pentapharm), Hydroxyprolisilane CTM (Exsymol), Argireline™,
Leuphasyl™, Aldenine™, Tryptgen™, Eyeseryl™, Serilesine™ or Decorinyl™ (Lipotec), Collaxyl™
or Quintescine™ (Vincience), BONT-L-Peptide™ (Infinitec Activos), Cytokino™LS (Laboratoires
Serobiologiques/Cognis), Kollaren™, IP2000™ or Meliprene™ (Institut Europeen de Biologie
Cellulaire), Neutrazen™ (Innovations), ECM-Protect™ (Atrium Innovations), Timp-Peptide™ or
ECM Moduline™ (Infinitec Activos).

**Composition preparation**
The compositions of the present invention are generally prepared by conventional methods such as are
known in the art of making topical and oral compositions and compositions for injection. Such methods
can typically be conducted in one or more steps, with or without heating, cooling, and the like.

The physical form of the compositions according to the invention is not important: they may be in any
galenic form such creams, lotions, milk or cream ointments, gels, emulsions, dispersions, solutions,
suspensions, cleansers, foundations, anhydrous preparations (sticks, in particular lipbalm, body and bath
oils), shower and bath gels, shampoo and scalp treatment lotions, cream or lotion for care of skin or
hair, make-up removing lotions or creams, sun-screen lotions, milks or creams, artificial suntan lotions,
creams or milks, pre-shave, shave or after-shave creams, foams, gels or lotions, make-up, lipsticks,
mascaras or nail varnishes, skin "essences," serums, adhesive or absorbent materials, transdermal
patches, or powders, emollient lotion, milk or cream, sprays, oils for the body and the bath, foundation
tint bases, pomade, emulsion, colloid, compact or solid suspension, pencil, sprayable or brossable
formulation, blush, red, eyeliner, lipliner, lip gloss, facial or body powder, styling foams or gels, nail
conditioner, lip balms, skin conditioners, moisturizers, hair sprays, soaps, body exfoliants, astringents,
depilatories and permanent waving solutions, antidandruff formulations, anti-sweat and antiperspirant compositions, nose sprays and so on. These compositions can also be presented in the form of lipsticks intended to apply color or to protect the lips from cracking, or of make-up products for the eyes or tints and tint bases for the face. Compositions in accordance with the invention include cosmetics, personal care products and pharmaceutical preparations. The present invention may also be applied on animal skin and/or appendages. One can also consider a composition in the shape of foam or in the form of compositions for aerosol also including a propellant agent under pressure.

Cosmetic compositions according to the invention may also be for orodental use, for example, toothpaste. In that case, the compositions may contain the usual adjuvants and additives for compositions for oral use and, in particular, surfactants, thickening agents, moisturizing agents, polishing agents such as silica, various active substances such as fluorides, particularly sodium fluoride, and, possibly, sweetening agents such as saccharin sodium.

The compound according to the present invention may be in the form of solution, dispersion, emulsion, paste, or powder, individually or as a premix or in vehicles individually or as a premix in vectors such as macro-, micro-, or nanocapsules, macro-, micro- or, nanoparticles, liposomes, oleosomes or chylomicrons, macro-, micro-, or nanoparticles or macro-, micro or nanospheres, spores or exines, micro or nano emulsions or adsorbed on organic polymer powders, talcs, bentonites, or other inorganic or organic supports.

The compound according to the present invention may be used in any form whatsoever, in a form bound to or incorporated in or absorbed in or adsorbed on macro-, micro-, and nanoparticles, or macro-, micro-, and nanocapsules, for the treatment of textiles, natural or synthetic fibres, wools, and any materials that may be used for clothing or underwear for day or night intended to come into contact with the skin, handkerchiefs or cloths, to exert their cosmetic effect via this skin/textile contact and to permit continuous topical delivery.

**Method of topical cosmetic or dermopharmaceutical treatment**

The present invention also concerns a topical treatment method to improve the general condition of the skin involving topical application to the skin of an effective amount of the composition of the invention as recited above. More specifically:

- to prevent and/or treat the signs of intrinsic and extrinsic skin ageing;
- to prevent and/or treat skin dehydration;
- to prevent and/or treat skin sagging and/or improve tone and/or firmness and/or elasticity and suppleness of the skin;
- to prevent and/or treat skin atrophy and/or improve the density of the dermis and epidermis;
- to give or return volume to the dermis and epidermis;
- For stimulating the expansion of adipose tissue,
- to lighten the skin;
- to prevent and/or treat skin roughness;
- to prevent and/or treat degradation of the skin due to the effects of oxidation;
- to prevent and/or treat hair loss;
- to prevent and/or treat glycation of molecules in the skin;
- to prevent and/or treat acne;
- To prevent and/or treat inflammatory states.

The composition according to the invention may be applied locally onto areas of the face, lips, neck, neckline, hands, feet, head or body. One of the major advantages of the present invention resides in the ability whenever necessary or desirable to be able to apply local selective "gentle" treatments through this topical, non-invasive method of application. In the case of anti-wrinkle use for example it may be applied very locally using a syringe or micro-canula.

It is also possible, however, to consider a composition containing the compound according to the invention intended to be injected subcutaneously.

According to other specific features the treatment method according to the invention can be combined with one or more other treatment methods targeting the skin such as luminotherapy, aromatherapy or heat treatments.

According to the invention, devices with several compartments or kits may be proposed to apply the method described above which may include for example and non-restrictively, a first compartment containing a composition including the invention compound, and in a second compartment a composition containing another active ingredient and/or excipient, the compositions contained in the said first and second compartments in this case being considered to be a combination composition for simultaneous, separate or stepwise use in time, particularly in one of the treatment methods recited above.

**Examples**

1/ **Formulation of an active ingredient according to the invention**

The compounds of the invention can be dissolved in a hydrophobic matrix (e.g. based on triglycerides) at a concentration typically of 2% w/w (=with regard to the total weight of the composition), corresponding to 20 000 ppm, in order to form an active ingredient that can be used in the manufacture of cosmetic products (as disclosed in below galenic examples of point 3/).

21 **In vitro TESTS**

The compounds of the invention demonstrate various activity cosmetics, affecting several domains of the skin physiology.

2/ Activity of the invention compound on adipocyte differentiation:

Some cosmetic compounds seek to encourage the installation of the subcutaneous fat for better aesthetics and greater volume. In this regard, *in vitro* tests were implemented in order to observe the
increase of adipocyte differentiation on cultured pre-adipocytes (with glycero 1-3-phosphate dehydrogenase (G3PDH) as the key enzyme of this differentiation).

**Effect of the compounds according to the invention on the G3PDH activity**

Principle: 3T3-L1 cells were grown to sub-confluence, then induced to differentiate with the appropriate cocktail in the presence or absence of geranyl geranyl hexenoate acetate (GGHE) or geranyl geranyl octadienoate acetate (GGOE) at different concentrations. After three days of incubation, the cocktail of differentiation is replaced by a new culture medium in the presence or absence of GGHE or GGOE. After 3 days of incubation, the cell layers were recovered and G3PDH activity is assayed, and then divided by the number of cells.

**Table 1:** Effect of GGHE and GGOE on G3PDH activity by cell in the adipocyte culture

<table>
<thead>
<tr>
<th>Product</th>
<th>Concentration</th>
<th>% Change/control (N=2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGHE</td>
<td>5µM</td>
<td>+77%; p&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>10µM</td>
<td>+97%; p&lt;0.01</td>
</tr>
<tr>
<td>GGOE</td>
<td>5µM</td>
<td>+83%; p&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>10µM</td>
<td>+84%; p&lt;0.01</td>
</tr>
</tbody>
</table>

Pioglytazone (positive control) 10µM: +224%; p<0.01

Thus, the compound of the invention, here the GGOE or GGHE at 5 and 10µM, significantly stimulates adipocyte differentiation. According to this result, the compounds can be recommended in any cosmetic composition for promoting expansion and/or formation of subcutaneous adipose tissue and/or stimulate lipogenesis and/or adipogenesis and/or adipocyte differentiation.

**2/2 Activity of the compound according to the invention on melanogenesis of human melanocytes in monolayers:**

The cosmetics industry is looking for compounds with depigmenting (whitening, skin depigmenting and lightening, elimination or mitigation of freckles, age spots etc.). *In vitro*, it is possible to demonstrate such an effect by measuring the melanin synthesized by melanocytes cultures that had or not been in contact with the compounds to be evaluated.

**Effect of the compounds according to the invention on the quantity of synthetized melanin**

Principle: Human melanocytes are cultured and contacted or not with the geranylgeranyl ethyl hexenoate (GGHE) or the geranylgeranyl methyl pentenoate (GGPM), at different concentrations, for 5 days. After incubation, the melanin content is measured in the cell homogenates, then divided by the cell number.

**Table 2:** Effect of GGHE and GGPM on melanin synthesis with regard to cell in a melanocyte culture

<table>
<thead>
<tr>
<th>Product</th>
<th>Concentration</th>
<th>Melanin (% Change/Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGHE</td>
<td>1ppm</td>
<td>-10% p &lt; 0.01</td>
</tr>
<tr>
<td></td>
<td>3ppm</td>
<td>-22% p &lt; 0.01</td>
</tr>
<tr>
<td></td>
<td>5ppm</td>
<td>-30% p &lt; 0.01</td>
</tr>
</tbody>
</table>
Arbutin (positive control) 0.06% = -57%; p<0.01

A significant and dose dependant decrease of the melanin synthesis by the human melanocyte is observed in the presence of the two GGHE and GGPM compounds of the invention.

2/3 Anti-radical and anti-oxydant effects of the compounds of the invention:

Oxygen free radicals are produced during normal physiological processes such as breathing or the inflammatory response, but may cause serious cell damage involved in skin aging if produced in excessive amounts (oxidative stress), then passing over the antioxidant defense mechanisms. Therefore, in particular according to this, anti-radical compounds, and thus the invention compounds, can present an interest in the anti-aging cosmetic compositions.

Principle: The ORAC test (Oxygen-Radical Absorbance Capacity) measures the oxidative degradation of a fluorescent molecule (fluorescein). Degradation of fluorescein by peroxy radicals generated by AAPH (2,2’-azobis (2-amidinopropane) dichloride) induces a decrease in fluorescence that can be measured by a spectrofluorometer, during a degradation kinetic.

An antioxidant protects fluorescein against this radical degradation. The fluorescence decrease will be smaller and slower in the presence of the antioxidant than in its absence. The comparison between the two kinetic parameters enables to calculate a protection percentage against free radical degradation.

Table 3: Effect of GGHE, GGOE and GGPM on fluorescein degradation by peroxy radicals

<table>
<thead>
<tr>
<th>% of protection</th>
<th>Control</th>
<th>GGA 10ppm</th>
<th>GGPE 10ppm</th>
<th>GGHE 10ppm</th>
<th>GGOE 10ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student t Test</td>
<td>REF</td>
<td>-3%</td>
<td>43%</td>
<td>32%</td>
<td>42%</td>
</tr>
</tbody>
</table>

Positive control = Trolox 2µM = 47% (p<0.01); nsd = non significative data

A significant protection against peroxy radicals in the presence of GGPE, GGHE and GGOE, each at 10ppm, is observed. The compounds according to the invention have in this test an antiradical activity higher to geranylgeranyacetone (GGA), known anti-aging molecule (the subject matter of a patent of the Applicant).

2/4 Keratinocyte protection against UVB by the invention compounds:

Skin is very sensitive to UV radiations. Overexposure to the sun (which includes UV A and B in its spectrum) can lead to premature aging of the skin, and even to cancer process. Thus, it is important for
the cosmetics industry to find compounds able to counteract the negative effects of UV radiations. Keratinocytes in monolayer after UVB irradiation (12 to 240mJ/cm²) develop on their surface many buds, separate themselves from the culture support and are damaged that can go up to death. A cell count at various times after UVB irradiation can be used to evaluate the cell viability of the culture. This model is widely used in cosmetics to evaluate the protective effect of various compounds against the deleterious effects of UVB stress.

**Principle:** Keratinocytes are cultured in 35mm Petri dish. Just at confluence, the cells are contacted or not with the GGHE and GGOE invention compounds for 24 hours. UVB irradiation (50mJ/cm²) is performed the next day, and then the cells are or not contacted with the invention compounds. 6 days later, the cells are counted to determine cell viability.

**Table 4:** Quantification of the number of cells post UVB stress

<table>
<thead>
<tr>
<th>Concentration</th>
<th>mean (n=3)</th>
<th>Ecart type</th>
<th>% change /control</th>
<th>Stat (t student)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0,43</td>
<td>0,014</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>GGHE 1ppm</td>
<td>0,671</td>
<td>0,079</td>
<td>+56%</td>
<td>p&lt;0,01</td>
</tr>
<tr>
<td>GGHE 2,5ppm</td>
<td>0,674</td>
<td>0,075</td>
<td>+57%</td>
<td>p&lt;0,01</td>
</tr>
<tr>
<td>Control</td>
<td>0,447</td>
<td>0,05</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>GGOE 1ppm</td>
<td>0,639</td>
<td>0,162</td>
<td>+43%</td>
<td>p&lt;0,05</td>
</tr>
<tr>
<td>GGOE 2,5ppm</td>
<td>0,658</td>
<td>0,039</td>
<td>+47%</td>
<td>p&lt;0,01</td>
</tr>
</tbody>
</table>

The GGHE and GGOE compounds according to the invention, at concentrations of 1 and 2,5ppm have a significant protective effect against the UVB stress effects.

**2/5 Action on decorin, molecule of the dermis:**

Decorin is a leucine-rich proteoglycan involved in the assembly of the dermis, by binding to collagen fibers and tropoelastin. The quality of this assemblage reflects the skin mechanical properties: elasticity, compressibility and firmness.

**Principle:** Normal human fibroblasts were brought to confluence and then placed or not in contact with the GGPE, GGOE and GGHE invention compounds, at 5ppm, for 3 days. After this incubation, decorin content was assayed by ELISA in cell homogenates, and divided by the number of cells.

**Table 5:** Effect of GGHE, GGOE and GGPE on the biosynthesis of decorin with regard to cell in a fibroblast culture

<table>
<thead>
<tr>
<th>Stimulation %</th>
<th>Control</th>
<th>GGPE 5ppm</th>
<th>GGHE 5ppm</th>
<th>GGOE 5ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF</td>
<td>+62%</td>
<td>+56%</td>
<td>+54%</td>
<td></td>
</tr>
<tr>
<td>Student t test</td>
<td>p&lt;0,01</td>
<td>p&lt;0,01</td>
<td>p&lt;0,01</td>
<td></td>
</tr>
</tbody>
</table>
A significant increase in the decorin synthesis by human fibroblast is observed in the presence of 5ppm of the GGHE, GGPE and GGOE compounds of the invention.

**2/6 Action on nidogen 1, molecule of the dermal-epidermal junction:**

Nidogen 1 is a key component of the basal membrane. It stabilizes and strengthens the basal membrane by linking laminin to collagen 4.

**Principle:** Normal human fibroblasts were brought to confluence and then placed or not in contact with the GGPE, GGOE and GGHE compounds of the invention at 5ppm for 3 days. After this incubation, the content Nidogen 1 is determined by ELISA in cell homogenates, and divided by the number of cells.

**Table 6:** Effect of GGHE, GGOE and GGPE on nidogen 1 biosynthesis by cell in a fibroblast culture

<table>
<thead>
<tr>
<th>Stimulation %</th>
<th>Control</th>
<th>GGPM 5ppm</th>
<th>GGPE 5ppm</th>
<th>GGOE 5ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student t test</td>
<td>REF</td>
<td>+43%</td>
<td>+117%</td>
<td>+86%</td>
</tr>
<tr>
<td></td>
<td>p&lt;0.01</td>
<td>p&lt;0.01</td>
<td>p&lt;0.01</td>
<td>p&lt;0.01</td>
</tr>
</tbody>
</table>

A significant increase of the nidogen 1 synthesis by human fibroblast is observed in the presence of 5ppm of each of the four compounds according to the invention (GGPM, GGPE, GGHE and GGOE).

Other activities can of course be highlighted according to other appropriated tests, in particular using *in vivo* tests.

**2/7 Influence of the GGOE on the syndecan 1 synthesis by human keratinocytes**

Syndecan 1 is a small proteoglycan transmembran protein that is strongly implicated in keratinocyte activation and cohesion. The production of syndecan 1 diminishes with age resulting in a lack of cohesion at the level of epidermis (in the supra basal layers).

**Principle:** Human keratinocytes are cultivated in a growth medium. After 6 days of incubation, the cells are contacted or not with the tested products (GGOE and GGA) at 3, 5 or 7 ppm for 48h. After incubation, the supernatants are taken and the syndecan 1 content is assayed by ELISA in these supernatants. The cell layers are sonicated and the cell number is evaluated by Hoechst method.

**Table 7:** Influence of GGOE (and compared to GGA) on syndecan 1 synthesis in human keratinocytes supernatants (n=3)

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Syndecan 1 (pg / 10^6 cell)</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>136.0 ± 10.0</td>
<td>Reference</td>
</tr>
<tr>
<td>GGA</td>
<td>3ppm</td>
<td>141.3 ± 12.9</td>
</tr>
<tr>
<td></td>
<td>5ppm</td>
<td>155.7 ± 14.4</td>
</tr>
<tr>
<td></td>
<td>7ppm</td>
<td>183.4 ± 21.9</td>
</tr>
<tr>
<td>Control</td>
<td>136.4 ± 19.0</td>
<td>Reference</td>
</tr>
<tr>
<td>GGOE</td>
<td>3ppm</td>
<td>353.4 ± 57.2</td>
</tr>
<tr>
<td></td>
<td>5ppm</td>
<td>424.3 ± 69.1</td>
</tr>
<tr>
<td></td>
<td>7ppm</td>
<td>435.9 ± 18.3</td>
</tr>
</tbody>
</table>
The results show that there is a significant and dose dependent stimulation of the synthesis of syndecan 1 in human keratinocyte in the presence of GGOE (stimulation > 200% in the presence of 7ppm of GGP).

Comparatively, the GGA presents a low stimulating activity of syndecan 1 synthesis (stimulation < 50% in the presence of 7 ppm of GGA).

Therefore, GGOE can boost the synthesis of syndecan 1 in keratinocytes to reinforce the skin cohesion.

3/ Galenic examples
3/1 Gel form for face

Ingredient according to the invention:

Formulation comprising 2% w/w of the compound of the invention in a hydrophobic matrix

Examples of other additional/optimal ingredients:

RIGIN™ is an ingredient product marketed by SEDERMA (FR 2788777 and WO 00/433417) improving the elasticity and firmness of skin, reinforcing hydration and smoothing skin.

REVIDRAT™ is an ingredient product marketed by SEDERMA which improves the epidemal cohesion and its hydration.

LUMISKIN™ is an ingredient product marketed by SEDERMA (WO 2004/024695) for lightening skin complexion.

SUBLISKIN™ is an ingredient product marketed by SEDERMA (WO 2009/055663) for hydrating and smoothing skin while enabling the skin to better resist to externa agressions.

MATRIXYL3000™ is an anti-wrinkle ingredient product marketed by WEDERMA (WO 2005/048968) which helps to reparer cutaneous damages caused by aging.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>INCI Name</th>
<th>Gel n1</th>
<th>Gel n2</th>
<th>Gel n3</th>
<th>Gel n4</th>
<th>Gel n5</th>
<th>Gel n6</th>
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<td>Qsp 100</td>
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<td>Phase G</td>
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</tbody>
</table>


**Gel n°1 features:** Volumizing effect by «lipofilling like», anti-aging (antioxydant), lightening and firming.

**Gel n°2 features:** The additional active ingredient RIGIN™ reinforces the anti-aging properties of the active ingredient according to the invention, in particular improving the mechanical properties of the skin and its hydration.

**Gel n°3 features:** The additional active ingredient REVIDRAT™ reinforces the epidermal cohesion and increases the effects of the invention ingredient (volumizing effect by stimulation of the adipogenesis and lightening effect).

**Gel n°4 features:** The additional active ingredient LUMISKIN™ reinforces the lightening action of the invention compound.
Gel n°5 features: The invention compound associated with the MATRIXIL TM 3000 gives to this gel both protective and repairing properties against aging.

Gel n°6 features: to the properties of the invention compound, SUBLISKTN™ adds comfort and hydration effects to the skin.

3/2 Cream form for face

Ingredient according to the invention:

Formulation comprising 2% w/w of the compound of the invention in a hydrophobic matrix

Examples of other additional/optional ingredients:

KOMBUCHA™ is an ingredient product marketed by SEDERMA (FR 0209710) in particular used for densifying the adipocyte population and also to promote skin complexion.

STEROCARE™ is an anti-aging active ingredient marketed by SEDERMA (WO 99/18927) especially recommended for mature skin.

IDEALIFT™ is an anti-aging and calming active ingredient, containing the Tyr-Arg lipopeptide, marketed by SEDERMA (FR 09/53444). It improves the mechanical properties of the skin, especially to combat skin flaccidity (that is to say the firmness), for example at the jowls of the face. It is also an active known for its muscle relaxant properties and anti-rednesses. It stimulates the synthesis of elastic fibers.

Niacinamide, Retinoj Resveratrol : anti-aging actives, in particular anti-wrinkle actives.

<table>
<thead>
<tr>
<th>CREAM FORM FOR FACE</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredients</td>
<td>n°1</td>
</tr>
<tr>
<td><strong>Phase A</strong></td>
<td></td>
</tr>
<tr>
<td>H₂O</td>
<td>Water</td>
</tr>
<tr>
<td>Ultrez 10</td>
<td>Carbomer</td>
</tr>
<tr>
<td><strong>Phase B</strong></td>
<td></td>
</tr>
<tr>
<td>Glycerin</td>
<td>Glycerin</td>
</tr>
<tr>
<td>Panstat</td>
<td>Ethyl &amp; Methyl &amp; Propyl parabens</td>
</tr>
<tr>
<td><strong>Phase C</strong></td>
<td></td>
</tr>
<tr>
<td>Polawax GP 200</td>
<td>Cetearyl Alcohol &amp; polysorbate 20</td>
</tr>
<tr>
<td>Crodamol CS 90</td>
<td>Cetearyl Alcohol</td>
</tr>
<tr>
<td>Crodamol STS</td>
<td>PPG-3 Benzyl Ether Myristate</td>
</tr>
<tr>
<td>DC 200 5 cps</td>
<td>Dimethicone</td>
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<tr>
<td></td>
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<tr>
<td>---------------------</td>
<td>------------------</td>
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<tr>
<td><strong>Phase D</strong></td>
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<tr>
<td>Formula comprising</td>
<td>w/w of the invention compound in a hydrophobic matrix</td>
</tr>
<tr>
<td>Retinol</td>
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<tr>
<td>Resveratrol</td>
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</tr>
<tr>
<td><strong>Phase E</strong></td>
<td></td>
</tr>
<tr>
<td>Potassium sorbate</td>
<td></td>
</tr>
<tr>
<td><strong>Phase F</strong></td>
<td></td>
</tr>
<tr>
<td>NaOH 30%</td>
<td></td>
</tr>
<tr>
<td>Phase G</td>
<td></td>
</tr>
<tr>
<td>KOMBUCHA™</td>
<td></td>
</tr>
<tr>
<td>STEROCARE™</td>
<td></td>
</tr>
<tr>
<td>IDEALIFT™</td>
<td></td>
</tr>
<tr>
<td>Niacinamide 10% in water</td>
<td></td>
</tr>
<tr>
<td><strong>Phase H</strong></td>
<td></td>
</tr>
<tr>
<td>Fragrance</td>
<td></td>
</tr>
</tbody>
</table>

**Protocol:** Weigh Phase A and let swell for 30 minutes. Then heat Phase A to 75°C in a water bath. Heat the Phase B until dissolution. Add Phase B into Phase A. Heat Phase C in a water bath at 75°C.
While stirring, add Phase C to Phase (A+B). Extemporaneously add Phase D. Add Phase E, mix thoroughly. Neutralize with Phase F around 55 ° C. Add Phase G, then Phase H, mix thoroughly.

**Cream n°1 properties:** in particular a volumizing action by "lipofilling like", anti-aging (anti-oxidant), brightening/lightening and firming.

**Cream n°2 properties:** the anti-aging and oleodensifying effects of the invention compound are enhanced by the association with the Kombucha™.

**Cream n°3 properties:** it reinforces the anti-aging properties for mature skin, thanks to Sterocare™.

**Cream n°4 properties:** the described effects of the invention are associated to the calming and anti-redness effect of Idealift™.

**Cream n°5 properties:** the anti-aging treating effect of niacinamide is combined with the intrinsic properties of the compound of the invention.

**Cream n°6 properties:** the anti-aging treating effect of retinol is combined with the intrinsic properties of the compound of the invention.

**Cream n°7 properties:** resveratrol associated with compound of the invention will enable to obtain a skin lighter with fewer wrinkles and more flexible.

3/3 **Cream form for the body**

**Ingredient according to the invention:**

Formulation comprising 2% w/w of the compound of the invention in a hydrophobic matrix

**Examples of other additionnal optional ingredients:**

BIO-BUSTYL™ is an ingredient product marketed by SEDERMA (FR2668365) stimulating the cell metabolism and thus dynamising the skin, used in particular in cosmetic products for women bust. Tocopherol or vitamin E : anti-radical and antioxydant properties.

**O.D.A. WHITE™** is an ingredient product marketed by SEDERMA (WO 94/07837) indicated for lightening the skin by melanin synthesis reduction.

<table>
<thead>
<tr>
<th>CREAM FORM FOR BODY</th>
<th>Weight %</th>
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<tbody>
<tr>
<td>Ingredients</td>
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</tr>
<tr>
<td><strong>Phase A</strong></td>
<td></td>
</tr>
<tr>
<td>H₂O</td>
<td>Water qsp 100</td>
</tr>
<tr>
<td>Ultrez 10</td>
<td>Carbomer 0.40</td>
</tr>
<tr>
<td><strong>Phase B</strong></td>
<td></td>
</tr>
<tr>
<td>Glycerine</td>
<td>Glycerin 3.00</td>
</tr>
<tr>
<td>Panstat</td>
<td>Ethyl &amp; Methyl &amp; Propyl parabens 0.30</td>
</tr>
<tr>
<td><strong>Phase C</strong></td>
<td></td>
</tr>
<tr>
<td>Crill 3</td>
<td>Sorbitan Stearate 2.00</td>
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<tr>
<td>Marcol 82</td>
<td>Mineral oil 4.00</td>
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<td>Cromollient DP3A</td>
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<td>Cithrol GMS AS</td>
<td>Glyceryl stearate &amp; PEG 100 stearate 3.00</td>
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<tr>
<td><strong>Phase D</strong></td>
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<tr>
<td>Formula comprising 2%</td>
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</table>
w/w of the invention compound in an hydrophobic matrix

<table>
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<tr>
<th>Component</th>
<th>Concentration</th>
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<td>Tocopherol</td>
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</table>

**Phase E**
- Potassium sorbate: 0.10
- Potassium sorbate: 0.10
- Tocopherol: 0.5

**Phase F**
- NaOH 30%: 0.40
- Sodium hydroxide: 0.40
- H₂O: 4.00
- Water: 4.00

**Phase G**
- Bio-bustyl™: -
- Rahnella Soy Protein Ferment, Palmitoyl Oligopeptide: 3.00

**Phase H**
- Parfum: 0.10

**Protocol:** Weigh Phase A and let it swallow for 30 minutes. Heat Phase A at 75°C using a water bath. Heat Phase B until dissolution. Add Phase B into Phase A. Heat Phase C at 75°C in a water bath. While stirring, add Phase C to Phase (A+B) and extemporaneously add Phase D. Add Phase E, mix thoroughly. Neutralize with Phase F around 55°C, homogenise thoroughly. Add Phase G if appropriate, then Phase H, mix thoroughly.

**Cream n°1 Properties:** adapted to the buttocks with a high active concentration for a high « lipofilling like» and firming volumizing effect.

**Cream n°2 Properties:** adapted for the bust with in addition to the properties of the compound of the invention, the dynamising and firming effect of the Bio-bustyl™ ingredient.

**Cream n°3 Properties:** oily formula for hands particularly adapted for treating yellow spots appearing with aging.

**Cream n°4 Properties:** the antioxydant action of the invention compound is reinforced by the presence of tocopherol, this cream being thus adapted to protection against stress.

**3/4 Serum form**

**Ingredient according to the invention:**
- Formulation comprising 2% w/w of the compound of the invention in a hydrophobic matrix

**Examples of other additionnal/optional ingredients:**
- LUMISPHEPvETM™ is an ingredient product marketed by SEDERMA (WO04/024695). It is Association of polymethylmethacrylate microencapsulated diacetylboldine (DAB) and manganese titanium dioxide (Ti02Mn). Ti02Mn provides the skin with an instant even, luminous and mat complexion with no white residue when DAB brings a physiological lightening effect.
- PVEVIDRAT™ is an ingredient product marketed by SEDERMA, which improves the epidermal cohesion and its hydration.
- EVERMAT™ is an ingredient product marketed by SEDERMA (WO 2007/029187), which decreases the sebum secretion and thus participates in the treatment of oily skin.
HALOXYL™ is an ingredient product marketed by SEDERMA (WO 2005/102266) which improves the eye contour by reducing rings under the eyes.

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<td><strong>Phase E</strong></td>
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</tr>
<tr>
<td>LUMISPHERE™</td>
<td>Water (Aqua) (and) Titanium Dioxide (and) Polysorbate-20 (and) Cetyl Hydroxyethylcellulose (and) polymethylmethacrylate (and) Trilaurin (and) Diacetyl Boldine</td>
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<tr>
<td>EVERMAT™</td>
<td>Butylene Glycol (and) Enantia Chlorantha Extract (and) Oleanolic Acid</td>
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</tbody>
</table>
HALOXYL™ Water (Aqua) (and) Glycerin (and) Steareth-20 (and) N-Hydroxysuccinimide (and) Chrysin (and) Palmitoyl Oligopeptide (and) Palmitoyl Tetrapeptide-7

Phase G

Parfume Fragrance 0.10 0.10

Protocol: Phase A: Sprinkle carbomer in water, let swell 15 minutes. Mix Phase B. Pour Phase B in Phase A, homogenise. Then weigh Phase C, mix and add to Phase A+B, under stirring. Let swell 1 hour. Extemporaneously add Phase D in the previous phase under stirring. Neutralize with Phase E. Put under stirring. Then add Phase F. Allow to mix at least 1 hour under stirring, and then add Phase G. Mix thoroughly.

Serum n°1 properties: complexion lightening and face remodeling for more firmness and cohesion.

Serum n°2 properties: association of the effect of the compound according to the invention with a protection effect against UV A and B radiations.

Serum n°3 properties: association of the effect of the compound according to the invention with a hydration effect.

Serum n°4 properties: association of the effect of the compound according to the invention with a regulation effect of seborreic production in case of oily skins.

Serum n°5 properties: association of the effect of the compound according to the invention with an action against rings under the eyes and pro-inflammatory agents.

3/5 Oil form

Ingredient according to the invention:

Formulation comprising 2% w/w of the compound of the invention in a hydrophobic matrix

Examples of other additional/optional ingredients:

REVIDRAT™ is an ingredient product marketed by SEDERMA, which in particular improve epidermal cohesion and its hydration.

RENOVAGE™ is an ingredient product marketed by SEDERMA (FR 02885522, WO 2006/120646) which fight all signs of aging and stress.

<table>
<thead>
<tr>
<th>OIL FORM</th>
<th>INCI name</th>
<th>Oil n°1</th>
<th>Oil n°2</th>
<th>Oil n°3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredients</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crodamol GTCC</td>
<td>caprylic /capric triglycerides</td>
<td>Qspl00</td>
<td>Qspl00</td>
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<tr>
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<td>------</td>
</tr>
<tr>
<td><strong>Phase B</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formula comprising 2% w/w of the invention compound in an hydrophobic matrix</td>
<td>/</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
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<tr>
<td>REVIDRAT™</td>
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<td>3.00</td>
</tr>
<tr>
<td>RENOVAGE™</td>
<td>Caprylic/Capric Triglyceride-Teprenone</td>
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<td>3.00</td>
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<td><strong>Phase C</strong></td>
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<td>Fragrance</td>
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</tr>
</tbody>
</table>

**Protocol:** Weigh and homogenize Phase A under stirring. Add Phase B in Phase A and homogenise. Add Phase C in Phase (A+B) and homogenise.

**Oil no.1 properties:** Oleodensifying effect, protective against UV solar radiations.

**Oil no.2 properties:** REVIDRAT™ reinforce the effects of the compound of the invention adding a hydration dimension.

**Oil no.3 properties:** RENOVAGE™ reinforce the antioxydant effect of the compound of the invention in delaying senescence.
1. Polyterpenic compounds corresponding to formula I below:

\[
\begin{align*}
\text{(Xaa)}_p & \text{entity being either an amino-acid (with p=1) or any peptide having p amino-acids with p between 1 and 10),} \\
\text{With the exclusion of the compounds corresponding in formula I to n=3, m=0, Ri=H and R}_4 & \text{=methyl or ethyl.}
\end{align*}
\]

With n = 0 to 5, m = 0 to 5, Ri, R2 and R3, independently of each other, selected from H, an alkyl chain of 1 to 6 carbon atoms, an alcohol, alkoxy, amine and substituted amine group, and R4 selected from an alkyl, aryl, aralkyl, acyl, sugar or alkoxy chain of 1 to 6 carbon atoms, and corresponding amino-acid or peptides derivatives corresponding to the following formula VI:

2. Compounds according to claim 1, characterized in that n=3 so as to form a geranylgeranyl group.

3. Compounds according to claim 1 or 2, characterized in that R4 is an alkyl group of 1 to 6 carbon atoms, preferably an ethyl or methyl group.

4. Compound according to anyone of claims 1 to 3, characterized in that R2 is a methyl.

5. Compounds according to anyone of claims 1 to 4, characterized in that R1 and R3 are independently from each other either a methyl or a hydrogen atom.

6. Compounds according to anyone of claims 1 to 5, characterized in that m = 0.

7. Compound (GGHE) according to claim 6, characterized in that it corresponds to the following formula II:

\[
\begin{align*}
\text{With n = 3, m = 0, R}_1 & \text{= methyl and R}_4 \text{= ethyl.}
\end{align*}
\]

8. Compounds according to claim 6 having the formula VI with n = 3, m = 0, R1 = methyl and R4 = ethyl.

9. Compounds according to anyone of claims 1 to 5, characterized in that m = 1.

10. Compound (GGOE) according to claim 9, characterized in that it corresponds to the following formula III:
With \( n = 3, m = 1, R_1 = H, R_2 = \text{methyl}, R_3 = H \) and \( R_4 = \text{ethyl} \).

11. Compounds according to anyone of claims 1 to 10, characterized in that \( p = 6 \) in the \((Xaa)\_p\) entity.

12. Topical composition characterized in that it comprises, in a physiologically acceptable medium, as active ingredient, an effective amount of one or more compounds to below formulas I and VI:

\[
\text{formula I:} \\
\text{with } n = 0 \text{ to } 5, m = 0 \text{ to } 5, R_i, R_2 \text{ and } R_3, \text{ independently of each other, selected from } H, \text{ an alkyl chain of } 1 \text{ to } 6 \text{ carbon atoms, an alcohol, alkoxy, amine and substituted amine group, and } R_4 \text{ selected from an alkyl, aryl, aralkyl, acyl, sugar or alkoxy chain of } 1 \text{ to } 6 \text{ carbon atoms, and corresponding amino-acid or peptides derivatives corresponding to the following formula VI:}
\]

\[
(Xaa)\_p \text{ entity being either an amino-acid (with } p = 1) \text{ or any peptide having } p \text{ amino-acids with } p \text{ between } 1 \text{ and } 10.
\]

13. Composition according to claim 12, characterized in that \( n = 3 \) in formulas I and VI.

14. Composition according to claim 13, characterized in that \( R_4 \) is an alkyl group of 1 to 6 carbon atoms, preferably an ethyl or methyl group.

15. Composition according to claim 13 or 14, characterized in that \( R_3 \) is a methyl group.

16. Composition according to anyone of claims 13 to 15, characterized in that \( R_1 \) and \( R_2 \) are independently from each other either a methyl or a hydrogen atom.

17. Composition according to anyone of claims 13 to 16, characterized in that \( m = 0 \).

18. Composition according to claim 17, the compound (GGHE) having the following formula II:

\[
\text{With } n = 3, m = 0, R_1 = \text{methyl} \text{ and } R_4 = \text{ethyl}.
\]

19. Composition according to claim 17, the compound (GGPE) having the following formula IV:
With \( n = 3, \ m = 0, \ R_1 = H \) and \( R_4 = \text{ethyl} \).

20. Composition according to claim 17, the compound (GGPM) having the following formula V:

\[
\begin{array}{c}
\text{H} \\
\text{C} \\
\text{O}
\end{array}
\]

With \( n = 3, \ m = 0, \ R_1 = H \) et \( R_4 = \text{methyl} \).

21. Composition according to anyone of claims 13 to 16, characterized in that \( m = 1 \).

22. Composition according to claim 21, the compound (GGOE) having the following formula III:

\[
\begin{array}{c}
\text{H} \\
\text{C} \\
\text{O}
\end{array}
\]

With \( n = 3, \ m = 1, \ R_1 = H, \ R_2 = \text{methyl}, \ R_3 = H \) and \( R_4 = \text{ethyl} \).

23. Composition according to anyone of claims 13 to 22, wherein \( p \) of \((Xaa)_p\) entity in formula VI is comprised between 1 and 6.

24. Composition according to anyone of claim 13 to 23, for the cosmetic non therapeutic treatment of skin conditions to improve the appearance of the skin.

25. Composition according to claim 24, for the prevention and treatment of skin aging.

26. Composition according to claim 24 or 25, for an anti radical and/or anti oxidant treatment.

27. Composition according to anyone of claims 24 to 26, for the treatment of loss of mechanical properties, in particular, skin tone, firmess, elasticity.

28. Composition according to anyone of claims 24 to 27, for skin volumizing by stimulating the adipocyte synthesis.

29. Composition according to anyone of claims 24 to 28, for skin lightening.

30. Composition according to anyone of claims 24 to 29, characterized in that it comprises at least one additional active ingredient selected from agents for lightening, anti-redness, sunscreening, moisturizing, humectants, exfoliating, anti-aging, anti-wrinkle and fine lines, stimulating the collagen and/or elastin synthesis, volumizing, elastic properties improving, anti-acne, anti-inflammatory, anti-oxidants, anti-free radical, depigmenting agents, depilatories, anti-regrowth or promoting the growth agents, peptides, vitamins.

31. Composition according to anyone of claims 24 to 30, characterized in that the amount of the active compound is comprised between 0.000001% and 15% w/w, more preferably between 0.0001%> and 5% w/w.

32. A method of treating the aging skin comprising topically applying the composition according to anyone of claims 24 to 31 to the skin of a subject in need thereof.