



(51) International Patent Classification:

A61K 8/35 (2006.01) A61Q 19/08 (2006.01)
A61K 8/44 (2006.01)

(21) International Application Number:

PCT/EP2024/067515

(22) International Filing Date:

21 June 2024 (21.06.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

PCT/CN2023/103648

29 June 2023 (29.06.2023) CN
23189624.2 04 August 2023 (04.08.2023) EP

(71) Applicant (for all designated States except AE, AG, AU, BB, BH, BN, BW, BZ, CA, CL, CR, CY, DE, DJ, DM, DO, EC, EG, GB, GD, GH, GM, GT, HN, IE, IL, IN, IQ, IR, IT, JM, JO, KE, KH, KN, KR, KW, LA, LC, LK, LS, MA, MD, MT, MU, MW, MY, MZ, NA, NG, NI, NZ, OM, PA, PE, PG, QA, RS, RU, RW, SA, SC, SD, SG, SL, SV, SZ, TH, TN, TR, TT, TZ, UG, US, VC, VN, WS, ZA, ZM, ZW): **UNILEVER IP HOLDINGS B.V.** [NL/NL]; Weena 455, 3013 AL Rotterdam (NL).

(71) Applicant (for all designated States except AL, AO, AT, BA, BE, BF, BG, BJ, BR, CF, CG, CH, CI, CM, CN, CO, CU, CV, CZ, DK, DZ, EE, ES, FI, FR, GA, GE, GN, GQ, GR, GW, HR, HU, ID, IS, JP, KM, KP, LR, LT, LU, LV, LY, MC, ME, MG, MK, ML, MN, MR, MX, NE, NL, NO, PH, PL, PT, RO, SE, SI, SK, SM, SN, ST, SY, TD, TG, UA, US, UZ): **UNILEVER GLOBAL IP LIMITED** [GB/GB]; Port Sunlight, Wirral Merseyside CH62 4ZD (GB).

(71) Applicant (for US only): **CONOPCO, INC., D/B/A UNILEVER** [US/US]; 700 Sylvan Avenue, Englewood Cliffs, New Jersey 07632 (US).

(72) Inventors: **GU, Xuelan**; Unilever Innovation Centre Wageningen B.V. Bronland 14, 6708 WH Wageningen (NL). **XIAO, Xue**; Unilever Innovation Centre Wageningen B.V. Bronland 14, 6708 WH Wageningen (NL).

(74) Agent: **JAMES, Helen, Sarah**; Unilever Patent Group Bronland 14, 6708 WH Wageningen (NL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,

HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))

(54) Title: PERSONAL CARE COMPOSITION BASED ON CARBOXYMETHYL CYSTEIN COMPOUND AND CAROTENOID OR ESTER THEREOF

(57) Abstract: Disclosed is a personal care composition comprising carboxymethyl cysteine compound and carotenoid compound, wherein the carotenoid compound is selected from carotenoid and ester thereof, wherein the weight ratio of the carboxymethyl cysteine compound to the carotenoid compound is in the range of 40:1 to 1:25.

PERSONAL CARE COMPOSITION BASED ON CARBOXYMETHYL CYSTEINE
COMPOUND AND CAROTENOID OR ESTER THEREOF

Field of the Invention

The present invention relates to a personal care composition comprising carboxymethyl cysteine
5 compound and carotenoid compound, wherein the carotenoid compound is selected from
carotenoid and ester thereof. It was unexpectedly found that the expression of collagen type I
alpha I chain was significantly enhanced by such composition.

Background of the Invention

10 The skin is a primary barrier of the human body. It protects the organs in the body from external
stimulations. It is subject to intrinsic aging and extrinsic aging. Skin aging is a complex process,
and alterations in human skin due to aging have distinct characteristics as compared to other
organs. Characteristics of intrinsic or chronological skin aging include dryness, visible free lines
and wrinkles, uneven skin pigmentation, loss of elasticity and skin sagging. Extrinsic factors
15 including exposure to sunlight, pollutants and cigarette smoke can accelerate the skin aging
process, especially on the face.

Collagen, the predominant matrix of the skin protein, is known to impart tensile strength to skin.
It has been shown that collagen is significantly reduced with age and UV exposure. The
20 degradation or destruction of the architecture of collagen decreases the tensile strength of the
skin and therefore causing wrinkles and laxity. Collagen destruction is thought to underlie the
characteristic alterations in the appearance of aged skin.

One of the most efficient ways for providing the effect of anti-aging is to promote the production
25 of collagen. Upregulating the expression of collagen synthesizing genes typically leads to an
increase in collagen production.

Therefore, the present inventors have recognized that there is a need to develop solution to
enhance the expression of collagen synthesizing genes, for example collagen type I alpha I chain
30 (COL1A1). It was surprisingly found that by combining carboxymethyl cysteine compound and
carotenoid compound, wherein the carotenoid compound is selected from carotenoid and ester
thereof and the weight ratio of the carboxymethyl cysteine compound to the carotenoid compound
is in the range of 40:1 to 1:25, the expression of COL1A1 was significantly upregulated.

Summary of the Invention

In a first aspect, the present invention is directed to a personal care composition comprising a personal care composition comprising carboxymethyl cysteine compound and carotenoid compound, wherein the carotenoid compound is selected from carotenoid and ester thereof, wherein the weight ratio of the carboxymethyl cysteine compound to the carotenoid compound is in the range of 40:1 to 1:25.

In a second aspect, the present invention is directed to a method of providing the skin benefits selected from the group consisting of enhancing collagen production in the skin, improving skin elasticity, reducing the appearance of wrinkles, reducing sagging, anti-aging and upregulating the expression of collagen synthesizing gene comprising a step of topically applying to the skin the composition of the composition of the present invention.

In a third aspect, the present invention is directed to use of the composition of the present invention for providing the skin benefits selected from the group consisting of enhancing collagen production in the skin, improving skin elasticity, reducing the appearance of wrinkles, reducing sagging, anti-aging and upregulating the expression of collagen synthesizing gene.

All other aspects of the present invention will more readily become apparent upon considering the detailed description and examples which follow.

Detailed Description of the Invention

Except in the examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use may optionally be understood as modified by the word "about".

All amounts are by weight of the composition, unless otherwise specified.

It should be noted that in specifying any range of values, any particular upper value can be associated with any particular lower value.

For the avoidance of doubt, the word "comprising" is intended to mean "including" but not necessarily "consisting of" or "composed of". In other words, the listed steps or options need not be exhaustive.

The disclosure of the invention as found herein is to be considered to cover all embodiments as found in the claims as being multiply dependent upon each other irrespective of the fact that claims may be found without multiple dependency or redundancy.

- 5 Where a feature is disclosed with respect to a particular aspect of the invention (for example a composition of the invention), such disclosure is also to be considered to apply to any other aspect of the invention (for example a method of the invention) *mutatis mutandis*.

The carboxymethyl cysteine compound refers to compound selected from carboxymethyl
10 cysteine, salt of carboxymethyl cysteine, ester of carboxymethyl cysteine, amide of carboxymethyl cysteine or a mixture thereof. Preferably, the carboxymethyl cysteine compound comprises carboxymethyl cysteine, ester of carboxymethyl cysteine, and/or salt of carboxymethyl cysteine. More preferably, the carboxymethyl cysteine compound comprises carboxymethyl cysteine, and/or salt of carboxymethyl cysteine. Even more preferably, carboxymethyl cysteine
15 compound comprises salt of carboxymethyl cysteine. Still even more preferably the carboxymethyl cysteine compound comprises lysine carboxymethyl cysteinate and most preferably, the carboxymethyl cysteine compound is lysine carboxymethyl cysteinate.

Preferably, the carboxymethyl cysteine compound is present in amount of at least 0.00001%,
20 more preferably at least 0.0001%, even more preferably at least 0.001%, still even more preferably at least 0.01%, and most preferably at least 0.1% by weight of the composition. Preferably, the carboxymethyl cysteine compound is present in amount of no greater than 5%, more preferably no greater than 3%, even more preferably no greater than 1%, still even more preferably no greater than 0.5%, and most preferably no greater than 0.5% by weight of the
25 composition.

Preferably, the lysine carboxymethyl cysteinate is present in amount of no greater than 10%, more preferably no greater than 5%, even more preferably no greater than 3%, still even more preferably no greater than 1%, and most preferably no greater than 0.5% by weight of the
30 composition. Preferably, the lysine carboxymethyl cysteinate is present in amount of at least 0.00001%, more preferably at least 0.0001%, even more preferably at least 0.001%, still even more preferably at least 0.01%, and most preferably at least 0.1% by weight of the composition.

The composition of the present invention comprises carotenoid compound. The carotenoid
35 compound is selected from carotenoid and ester thereof. Preferably, the carotenoid compound is

selected from carotenes, xanthophylls, and esters thereof. More preferably, the carotenoid compound is selected actinioerythrol, astaxanthin, capsanthin, capsorubin, apocarotenal, cryptoxanthin, lutein, zeaxanthin, and esters thereof. Even more preferably the carotenoid compound is selected from astaxanthin, zeaxanthin, lutein, cryptoxanthin, capsanthin, actinioerythrol and esters thereof. Still even more preferably the carotenoid compound is selected from astaxanthin and esters thereof. Most preferably, the carotenoid compound is astaxanthin.

In a preferred embodiment, the present invention provides a personal care composition comprising carboxymethyl cysteine compound and astaxanthin compound, wherein the astaxanthin compound is selected from astaxanthin and ester thereof.

The ester of astaxanthin is preferably astaxanthin fatty acid ester, more preferably astaxanthin C₆-C₂₄ fatty acid ester and even more preferably astaxanthin C₈-C₂₀ fatty acid ester.

Preferably, the carotenoid compound is present in amount of at least 0.00001%, more preferably at least 0.0001%, even more preferably at least 0.001%, still even more preferably at least 0.01%, and most preferably at least 0.1% by weight of the composition. Preferably, the carotenoid compound is present in amount of no greater than 5%, more preferably no greater than 2%, even more preferably no greater than 0.5%, still even more preferably no greater than 0.1%, and most preferably no greater than 0.01% by weight of the composition.

Preferably, the total astaxanthin and ester of astaxanthin is present in amount of at least 0.00001%, more preferably at least 0.0001%, even more preferably at least 0.001%, still even more preferably at least 0.01%, and most preferably at least 0.1% by weight of the composition.

Preferably, the total astaxanthin and ester of astaxanthin is present in amount of no greater than 5%, more preferably no greater than 2%, even more preferably no greater than 0.5%, still even more preferably no greater than 0.1%, and most preferably no greater than 0.01% by weight of the composition.

Preferably, the astaxanthin is present in amount of at least 0.00001%, more preferably at least 0.0001%, even more preferably at least 0.001%, still even more preferably at least 0.01%, and most preferably at least 0.1% by weight of the composition. Preferably, the astaxanthin is present in amount of no greater than 5%, more preferably no greater than 2%, even more preferably no greater than 0.5%, still even more preferably no greater than 0.1%, and most preferably no greater than 0.01% by weight of the composition.

The weight ratio of the carboxymethyl cysteine compound to the carotenoid compound is in the range of 40:1 to 1:25, more preferably in the range of 40:1 to 1:10, even more preferably in the range of 15:1 to 1:3, and most preferably in the range of 5:1 to 1:1. Preferably, the weight ratio of the carboxymethyl cysteine compound to total astaxanthin and ester of astaxanthin is in the range of 40:1 to 1:25, more preferably in the range of 40:1 to 1:10, even more preferably in the range of 15:1 to 1:3, and most preferably in the range of 5:1 to 1:1. Preferably, the weight ratio of the lysine carboxymethyl cysteinate to total astaxanthin and ester of astaxanthin is in the range of 40:1 to 1:25, more preferably in the range of 40:1 to 1:10, even more preferably in the range of 15:1 to 1:3, and most preferably in the range of 5:1 to 1:1. Preferably, the weight ratio of the lysine carboxymethyl cysteinate to the astaxanthin is in the range of 40:1 to 1:25, more preferably in the range of 40:1 to 1:10, even more preferably in the range of 15:1 to 1:3, and most preferably in the range of 5:1 to 1:1.

The composition may optionally comprise whitening pigment. Whitening pigments are typically particles of high refractive index materials. For example, the whitening pigment may have a refractive index of greater than 1.3, more preferably greater than 1.8 and most preferably from 2.0 to 2.7. Examples of such whitening pigment are those comprising bismuth oxy-chloride, boron nitride, barium sulfate, mica, silica, titanium dioxide, zirconium oxide, aluminium oxide, zinc oxide or combinations thereof. More preferred whitening pigment are particles comprising titanium dioxide, zinc oxide, zirconium oxide, mica, iron oxide or a combination thereof. Even more preferred whitening pigment are particles comprising zinc oxide, zirconium oxide, titanium dioxide or a combination thereof as these materials have especially high refractive index. Still even more preferably the whitening pigment is selected from titanium dioxide, zinc oxide or a mixture thereof and most preferred whitening pigment is titanium dioxide. The average diameter of whitening pigment is typical from 15 nm to 1 micron, more preferably from 35 nm to 800 nm, even more preferably from 50 nm to 500 nm and still even more preferably from 100 to 300 nm. Amount of whitening pigment may be 0.1 to 15%, preferably 0.5 to 5% by weight of the composition.

Preferably, the composition comprises a glutamate source selected from the group consisting of glutamine, glutamine ester, glutamic acid, pyroglutamic acid, salts, and mixtures thereof. More preferably, the composition comprises pyroglutamic acid and/or salt of pyroglutamic acid. Even more preferably, the composition comprises sodium salt of pyroglutamic acid. Preferably, the glutamate source is present in amount of 0.0001 to 10% by weight of the composition, more preferably 0.001 to 6%, even more preferably 0.01 to 3% by weight of the composition.

Preferably, the composition comprises polyhydric alcohol. Polyhydric alcohols may be selected from group of glycerin, propylene glycol, dipropylene glycol, polypropylene glycol, polyethylene glycol, sorbitol, hydroxypropyl sorbitol, hexylene glycol, 1,3-butylene glycol, isoprene glycol, 5 ethoxylated glycerol, propoxylated glycerol or a mixture thereof. Most preferred polyhydric alcohol is glycerol known also as glycerin. The amount of polyhydric alcohol may range anywhere from 0.1 to 20%, preferably 0.5 to 15% and more preferably 2 and 10% by weight of the composition.

Preferably, the composition comprises emollient materials. Suitable emollient materials include 10 silicones, hydrocarbons, triglycerides or a mixture thereof. These silicones may be organic, silicone-containing or fluorine-containing, volatile or non-volatile, polar or non-polar. Hydrocarbons may include mineral oil, petrolatum and polyalpha-olefins. Examples of preferred volatile hydrocarbons include polydecane such as isododecane and isodecane (e.g. Permethyl- 99A which is available from Presperse Inc.) and the C7-C8 through C12-C15 isoparaffins (such 15 as the Isopar Series available from Exxon Chemicals). Illustrative triglycerides but not limiting are sunflower seed oil, cotton oil, canola oil, soybean oil, castor oil, borage oil, olive oil, shea butter, jojoba oil and mixtures thereof. Mono- and di- glycerides may also be useful. Particularly preferable are glyceryl monostearate and glyceryl distearate.

20 Preferably, the composition comprises moisturizing agents. Particularly preferred moisturizing agents includes, petrolatum, aquaporin manipulating actives, oat kernel flour, substituted urea like hydroxyethyl urea, hyaluronic acid and/or its precursor N-acetyl glucosamine, hyaluronic acid and/or its precursor N-acetyl glucosamine, or a mixture thereof.

25 Some compositions may include thickeners. These may be selected from cellulose, natural gums and acrylic polymers but not limited by this thickening agent types. Among the cellulose are sodium carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl methylcellulose and combinations thereof. Suitable gums include xanthan, pectin, karaya, agar, alginate gums and combinations thereof. Among the acrylic thickeners are homopolymers and copolymers of acrylic 30 and methacrylic acids including carbomers such as Carbopol 1382, Carbopol 982, Ultrez, Aqua SF-1 and Aqua SF-2 available from the Lubrizol Corporation. Amounts of thickener may range from 0.01 to 3% by weight of the active polymer (outside of solvent or water) in the compositions.

In addition, the compositions of the invention may further include 0.5 to 10% by weight of 35 sequestering agents, such as tetra sodium ethylenediaminetetraacetate (EDTA), EHDP or

mixtures; opacifiers and pearlizers such as ethylene glycol distearate, titanium dioxide or Lytron 621 (Styrene/Acrylate copolymer); all of which are useful in enhancing the appearance or properties of the product.

- 5 The composition may comprise water in amount of 10 to 96% by weight of the composition, more preferably from 25 to 92%, even more preferably from 42 to 88%, most preferably from 55 to 82% by weight of the composition.

10 Preferably, the composition has a viscosity of at least 10 mPa·s, more preferably in the range 30 to 10000 mPa·s, even more preferably 50 to 5000 mPa·s, and most preferably 100 to 2000 mPa·s, when measured at 20 degrees C at a relatively high shear rate of about 20 s⁻¹.

Preferably, the composition is an emulsion, more preferably an oil-in-water emulsion. Preferably the composition is a fluid liquid at 25 °C and atmospheric pressure.

15 Preferably, the personal care composition is a skin care composition. Skin care composition refers to a composition suitable for topical application to human skin, including leave-on and wash-off products but preferably leave-on compositions. The term "leave-on" as used with reference to compositions herein means a composition that is applied to or rubbed on the skin, and left thereon. The term "wash-off" as used with reference to compositions herein means a skin
20 cleanser that is applied to or rubbed on the skin and rinsed off substantially immediately subsequent to application. The term "skin" as used herein includes the skin on the face, neck, chest, abdomen, back, arms, under arms, hands, and legs. Preferably "skin" means includes the skin on the face and under arms, more preferably skin means skin on the face other than lips and
25 eyelids. The composition is particularly preferably a moisturizer rather than a make-up product.

Preferably, the composition is a topical composition. Preferably, the composition may be in the form of cream, lotion, ointment, solution, suspension, emulsion, paste, gel, powder, powder foundation, emulsion foundation, wax foundation, or spray. More preferably, the composition may
30 be formulated in the form of cream, lotion, ointment, emulsion, gel, or a spray.

Preferably, the composition is capable of upregulating the expression of collagen type I alpha I chain gene by at least 1.8 fold change, more preferably 1.8 to 5 and most preferably 1.9 to 3.5 and most preferably 2 to 2.5 fold change, typically in comparison to personal care composition

comprising neither carboxymethyl cysteine compound nor carotenoid compound selected from carotenoid and ester thereof.

The present invention also provides use of carotenoid compound wherein the carotenoid compound is selected from carotenoid and ester thereof, for providing the skin benefits selected from the group consisting of enhancing collagen production in the skin, improving skin elasticity, reducing the appearance of wrinkles, reducing sagging, anti-aging and upregulating the expression of collagen synthesizing gene.

Preferably the use is non-therapeutic. Preferably the method is non-therapeutic. The term non-therapeutic typically means for cosmetic purposes and not curative or therapeutic purposes.

The following examples are provided to facilitate an understanding of the invention. The examples are not intended to limit the scope of the claims.

Examples

Materials

Supplier	Trade name	Active	Abbreviation	Active wt%
Sinerga	HAIR APP	Lysine carboxymethyl cysteinate	LCC	>98%
Tauto Biotech	Astaxanthin	Astaxanthin	AXT	≥98%

Example 1

This Example demonstrates the synergistic effect of upregulation of *COL1A1* gene expression by combining lysine carboxymethyl cysteinate and astaxanthin.

The normal human dermal fibroblasts (NHDF) (Biocell, Xi'an, China, Lot: Fb20081902) were incubated in medium together with or without actives for 48 hours. After incubation, the total RNA for each NHDF was extracted using RNAex Pro reagent (Accurate Biotechnology, Cat: AG21102) according to manufacturer's protocol.

The extracted RNA was quantified using Nanodrop spectrometer (Thermo Fisher Scientific, Waltham, MA, US) and reverse transcribed to generate the template cDNA using the Evo M-MLV RT Premix for qPCR (Accurate Biotechnology, Cat: AG11706) according to manufacturer's protocol. Gene expression of *COL1A1* gene was analyzed by polymerase chain reaction (PCR) using SYBR® Green Premix Pro Taq HS qPCR Kit (Accurate Biotechnology, AG11701). The

actin beta (*ACTB*) gene was selected as the housekeeping gene and all data on relative expression of the target genes was normalized to *ACTB* gene. The fold changes in expression were calculated relative to the blank control (medium having no active). All tests were conducted at least three times and Table 1 shows the fold changes in gene expression of *COL1A1*.

5

Table 1

	Active*	Fold change of <i>COL1A1</i> gene expression
Control	-	1.0
A	0.0016 wt% of LCC in medium	1.05
B	0.0006 wt% of AXT in medium	1.75
1	0.0016 wt% of LCC + 0.0006 wt% of AXT in medium	2.22 ^a

* The level of actives is weight percentage based on the amount of medium

a: significantly better ($p<0.05$) than either of single active at same level.

10 It was indicated from Table 1 that lysine carboxymethyl cysteinate alone is not capable of substantially upregulate the *COL1A1* gene expression. However, the combination of lysine carboxymethyl cysteinate and astaxanthin is capable of providing synergistic upregulation of *COL1A1* gene expression as the fold change of *COL1A1* gene expression by the combination is significantly higher than the product of fold changes of the single active alone ($1>A*B$).

15

Claims

1. A personal care composition comprising carboxymethyl cysteine compound and carotenoid compound, wherein the carotenoid compound is selected from carotenoid and ester thereof, wherein the weight ratio of the carboxymethyl cysteine compound to the carotenoid compound is in the range of 40:1 to 1:25.
2. The composition according to claim 1 wherein the carboxymethyl cysteine compound comprises carboxymethyl cysteine, ester of carboxymethyl cysteine, and/or salt of carboxymethyl cysteine.
3. The composition according to claim 2 wherein the carboxymethyl cysteine compound comprises salt of carboxymethyl cysteine and preferably the carboxymethyl cysteine compound comprises lysine carboxymethyl cysteinate.
4. The composition according to any one of the preceding claims wherein the carboxymethyl cysteine compound is present in amount of at least 0.00001% and no greater than 10% by weight of the composition, preferably carboxymethyl cysteine compound is present in amount of at least 0.01% and no greater than 3% by weight of the composition.
5. The composition according to any one of the preceding claims wherein the carotenoid compound is selected from astaxanthin, zeaxanthin, lutein, cryptoxanthin, capsanthin, actinioerythrol and esters thereof, preferably the carotenoid compound is selected from astaxanthin and esters thereof.
6. The composition according to any one of the preceding claims wherein the carotenoid compound is present in amount of at least 0.00001% and no greater than 2% by weight of the composition.
7. The composition according to any one of the preceding claims wherein the weight ratio of the carboxymethyl cysteine compound to the carotenoid compound is in the range of 40:1 to 1:10, preferably in the range of 5:1 to 1:1.
8. The composition according to any one of the preceding claims wherein the weight ratio of the carboxymethyl cysteine compound to total astaxanthin and ester of astaxanthin is in the range of 40:1 to 1:10, preferably in the range of 5:1 to 1:1.

9. The composition according to any one of the preceding claims wherein the composition is an emulsion, preferably an oil-in-water emulsion.
10. The composition according to any one of the preceding claims wherein the composition is a fluid liquid at 25 °C and atmospheric pressure.
11. The composition according to any one of the preceding claims wherein the composition comprises water in amount of 10 to 96% by weight of the composition, preferably from 42 to 88% by weight of the composition.
12. A method of providing the skin benefits selected from the group consisting of enhancing collagen production in the skin, improving skin elasticity, reducing the appearance of wrinkles, reducing sagging, anti-aging and upregulating the expression of collagen synthesizing gene comprising a step of topically applying to the skin the composition of any one of the preceding claims.
13. Use of the composition of any one of the preceding claims 1 to 11 for providing the skin benefits selected from the group consisting of enhancing collagen production in the skin, improving skin elasticity, reducing the appearance of wrinkles, reducing sagging, anti-aging and upregulating the expression of collagen synthesizing gene.
14. Use of carotenoid compound wherein the carotenoid compound is selected from carotenoid and ester thereof, for providing the skin benefits selected from the group consisting of enhancing collagen production in the skin, improving skin elasticity, reducing the appearance of wrinkles, reducing sagging, anti-aging and upregulating the expression of collagen synthesizing gene.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/067515

A. CLASSIFICATION OF SUBJECT MATTER INV. A61K8/35 A61K8/44 A61Q19/08 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A61K A61Q Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, CHEM ABS Data, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	WO 2023/126238 A1 (UNILEVER IP HOLDINGS B V [NL]; UNILEVER GLOBAL IP LTD [GB] ET AL.) 6 July 2023 (2023-07-06) claims 1-4, 12-13; examples -----	1 - 14
A	CN 113 546 000 B (BEIJING MEILI ZHENYAN COSMETICS CO LTD) 12 July 2022 (2022-07-12) claim 1; examples 18-20 -----	1 - 14
A	US 2010/150853 A1 (CASSIN GUILLAUME [FR] ET AL) 17 June 2010 (2010-06-17) paragraph [0466]; claims 1-3, 8 ----- - / - -	1 - 14
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "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 5 September 2024		Date of mailing of the international search report 16/09/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Krattinger, B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/067515

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE GNPD [Online] MINTEL; 27 March 2023 (2023-03-27), anonymous: "Spray", XP093122233, Database accession no. 10682344 paragraph [ingredients] -----	1 - 14
X	WO 2018/062427 A1 (ASTAREAL CO LTD [JP]) 5 April 2018 (2018-04-05) claims; examples -----	14
X	US 2010/330135 A1 (TASHIRO TOMOKO [JP] ET AL) 30 December 2010 (2010-12-30) paragraphs [0001] - [0004], [0029] - [0031]; claims; examples -----	14
X	CN 115 715 804 A (ALGACTIF LTD) 28 February 2023 (2023-02-28) claims -----	14
X	JP 2007 161681 A (MITSUI CHEMICALS INC) 28 June 2007 (2007-06-28) paragraphs [0093] - [0094]; claim 1 -----	14
X	AZIZ EJAZ ET AL: "Xanthophyll: Health benefits and therapeutic insights", LIFE SCIENCE, PERGAMON PRESS, OXFORD, GB, vol. 240, 26 November 2019 (2019-11-26), XP085964087, ISSN: 0024-3205, DOI: 10.1016/J.LFS.2019.117104 [retrieved on 2019-11-26] paragraph [02.6] - paragraph [02.7] -----	14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2024/067515

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2023126238 A1	06-07-2023	CN 118541138 A	23-08-2024
		WO 2023126238 A1	06-07-2023

CN 113546000 B	12-07-2022	NONE	

US 2010150853 A1	17-06-2010	BR PI0904749 A2	03-11-2010
		EP 2191869 A1	02-06-2010
		FR 2939036 A1	04-06-2010
		US 2010150853 A1	17-06-2010

WO 2018062427 A1	05-04-2018	JP 2018058820 A	12-04-2018
		WO 2018062427 A1	05-04-2018

US 2010330135 A1	30-12-2010	CN 101686923 A	31-03-2010
		EP 2170262 A1	07-04-2010
		JP 5101193 B2	19-12-2012
		JP 2009013129 A	22-01-2009
		KR 20100036359 A	07-04-2010
		KR 20130042056 A	25-04-2013
		TW 200911295 A	16-03-2009
		US 2010330135 A1	30-12-2010
		WO 2009008397 A1	15-01-2009

CN 115715804 A	28-02-2023	NONE	

JP 2007161681 A	28-06-2007	NONE	
