

THERMOPLASTIC POLYURETHANE FILM FOR DELIVERY OF ACTIVE AGENTS TO SKIN SURFACES

BACKGROUND

[0001] The exemplary embodiment relates to the delivery of active agents to skin surfaces and finds particular application in connection with a thermoplastic polyurethane film that serves as a vehicle for skin treatment active agents and a face mask or body patch formed from the film.

5 **[0002]** Face masks have been traditionally used for providing active agents to the face and other skin surfaces. The active agents may include vitamins, moisturizers, cleansers, anti-wrinkle agents, lightening agents, skin toning agents, and others.

[0003] Conventional face masks include hydrocolloid layers containing the
10 active agents and other nutrients. The hydrocolloid layers are often held together by fabric or a synthetic mesh which provides a physical and mechanical support. Such multi-layered face masks tend to be time consuming and costly to manufacture. Hydrocolloid face masks are typically formed by hot solution casting of a mixture of polysaccharide polymers such as carrageenan, locust bean gum
15 (galactomannans), agarose, agar, and xanthan gum. Generally the polysaccharide components are added to a mixture of water, glycerin, and polypropylene glycol and heated to approximately 80 to 90 °C to dissolve the polymer and obtain a molten state. The colloid solution is cooled to about 60 °C and the cosmetic additives are added. This intermediate cooling step is to avoid harming
20 temperature-sensitive active agents. The thickened solution is cast as a film with a knife at a set thickness. A rayon reinforcing material may be added. The solution is then cooled to 25 °C and kept between release films until the film sets to a firm gel before cutting to shape. The final gel film thickness is between 0.7 and 0.8 mm for hydrocolloid masks that are not reinforced and about 0.5 mm for reinforced masks.

25 **[0004]** Hydrocolloid face masks are also often opaque and slippery. This requires the subject being treated to lie down while the face mask is being applied and remain in this position for a treatment period of typically 30 – 60 minutes. Even if the subject is able to sit or stand, the face mask is very noticeable.

[0005] There remains a need for a face mask material with transparency, flexibility, strength and ability to adhere to the skin while the subject is in an upright position, which is able to deliver active agents to the skin and that would enable the subject to walk around and perform other activities while still continuing with the facial treatment. Additionally, the face mask material should not leave behind a residue the skin once it is removed so that there is no need to wash the face unless the skin treatment is to be removed. It would also be advantageous to be able to use cold processing techniques to form the face mask.

BRIEF DESCRIPTION

[0006] In accordance with one aspect of the exemplary embodiment, a polymer film includes at least 30 wt. % of a thermoplastic polyurethane polymer which is the reaction product of a first polyether polyol having a molecular weight of at least 3000 daltons, optionally, a second polyether polyol having a molecular weight of no more than 2500 daltons, at least one of a third polyol having a molecular weight of up to 800 daltons, and a chain extender, a diisocyanate, optionally, a catalyst; and up to 5 wt. % water.

[0007] In accordance with another aspect of the exemplary embodiment, a method of forming a face mask or body patch includes forming a thermoplastic polyurethane polymer from a first polyether polyol having a molecular weight of at least 3000 daltons, optionally, a second polyether polyol having a molecular weight of no more than 2500 daltons, and at least one of a third polyol having a molecular weight of up to 800 daltons and a chain extender. The method further includes casting the thermoplastic polyurethane polymer with an active agent in solution to form a cast film which includes the active agent dispersed in the thermoplastic polyurethane polymer.

[0008] In accordance with another aspect of the exemplary embodiment, a face mask or body patch includes a hydrated film which includes at least 50 wt. % water, 5 to 30 wt. % of a thermoplastic polyurethane polymer, and at least one active agent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIGURE 1 is a schematic top plan view of a face mask;

[0010] FIGURE 2 is a side sectional view of a hydrated face mask on the skin of a wearer;

[0011] FIGURE 3 illustrates a body patch;

[0012] FIGURE 4 illustrates rate of swell for an exemplary polyurethane film;

5 [0013] FIGURE 5 illustrates buffer uptake for different polyurethane films at different thicknesses;

[0014] FIGURE 6 illustrates percutaneous absorption by pig skin of 1.8% caffeine solution loaded on an exemplary polymer film;

10 [0015] FIGURE 7 shows percutaneous absorption by pig skin of a 1.8% caffeine solution loaded on an exemplary polymer film and on biocellulose (microbial cellulose);

[0016] FIGURE 8 shows percutaneous absorption by pig skin of 2% dimethylmethoxy chromanyl palmitate solution loaded on an exemplary polymer film;

15 [0017] FIGURE 9 shows salicylic acid penetration in skin from polymer films; and

[0018] FIGURE 10 shows lidocaine hydrochloride penetration in skin from polymer films.

DETAILED DESCRIPTION

20 [0019] Aspects of the exemplary embodiment relate to a polymer film which includes a thermoplastic polyurethane polymer, suited to use as a face mask or body patch, which may include one or more actives and/or excipients. The polymer film is able to absorb a considerable quantity of water that may include the one or more actives and/or excipients.

25 [0020] With reference to FIGURE 1, a cosmetic sheet facial mask (face mask) 10 suited to delivering an active agent 12 to a surface 14 of the skin of a person, such as the face, is shown. The illustrated face mask is contoured to fit the user's face, for example is generally oval in shape, or otherwise shaped to cover at least a part of a face of a wearer, and has apertures 16 appropriately positioned to align
30 with the eyes, nose, and/or mouth of the person.

[0021] In one embodiment, shown in FIGURE 2 (not to scale), the face mask 10 includes only a single water-insoluble film or layer 18 of a polyurethane material,

having a first surface **20** and a second surface **22**. In use, the first surface **20** contacts the surface **14** of the wearer's face while the second surface **22** is exposed to the atmosphere.

[0022] FIGURE 3 shows another embodiment, which suited to use as a body patch **30**. In this embodiment, the film **18** may be at least partially covered, on the outer surface **22**, by a second layer **32**. The layer **32** may serve as one or more of: an adhesive for assisting in adhering the layer **18** to the skin; a moisture barrier to resist drying out of the hydrated film; and a sterile layer to avoid contamination of the film with dirt, microorganisms, or the like. In this embodiment, the adhesive layer **32** and film **18** may be stored separately until use, e.g., in separate sterile packages, or may be stored as a combination of film and adhesive layer. The layer **32**, prior to use, may be covered by a removable liner material (not shown).

[0023] As will be appreciated, while the illustrated face mask/patch is formed as a single piece of film, a face mask may be formed from two or more pieces of the film, such as one piece covering an upper part of the wearer's face and one piece for covering a lower part, with a respective aperture or apertures in each part.

[0024] The polyurethane material of the film **18** includes a soft, flexible, clear thermoplastic polyurethane (TPU) or a blend of TPUs, which is extruded or solvent cast to form a thin film **18**. The exemplary thin film **18** is water-swellable but is not soluble in water.

[0025] The dry polyurethane film **18** may have a thickness, prior to hydration, of at least 0.08 mm, or at least 0.1 mm, or at least 0.2 mm and can be up to 1 mm in thickness, or up to 0.6 mm, or up to 0.4 mm, or up to 0.35 mm.

[0026] A water content of the dry polyurethane film **18** (prior to hydration) may be less than 5 wt. %, or less than 2 wt. %, or less than 1 wt. %. The thin polyurethane film **18** has a high water pickup. For example, when soaked in an aqueous formulation (at least 50 wt. % water) at room temperature (defined herein as 22-26°C) for a period of 30 minutes, the film may swell by at least 300 wt. % (2 g water/1 g polymer), or at least 500 wt. % (4 g water/1 g polymer), and in some embodiments, up to 2000 wt. % (19 g water/1 g polymer), or up to 1500 wt. % (14 g water/1 g polymer), or up to 1200 wt. % (10 g water/1 g polymer), or up to 1000 wt. % (9 g water/1 g polymer), while maintaining its integrity as a film.

[0027] While particular reference is made in the following to use of the film in a face mask, it is to be appreciated that a body patch is also contemplated.

[0028] The dry film **18** (or dry face mask **10** formed therefrom) may include at least 20 wt. % of thermoplastic polyurethane polymer as disclosed herein, or at least 30 wt. %, or at least 40 wt. %, or at least 50 wt. %, or at least 60 wt. %, or at least 70 wt. % of the thermoplastic polyurethane polymer, and in some embodiments up to 99.9 wt. %, or up to 99 wt. % of the thermoplastic polyurethane polymer, at room temperature. Polymers other than the thermoplastic polyurethane polymer disclosed herein which have a molecular weight of over 500 daltons may be present at up to 60 wt. %, or up to 50 wt. %, or up to 40 wt. %, or up to 20 wt. %, or up to 10 wt. % of the dry film.

[0029] One or more active agents may be present in the dry film/face mask in a pharmaceutically effective amount, i.e., an amount sufficient to have a beneficial effect on the skin. The amount of each active agent may thus vary, depending on the active agent being used. The one or more active agents may be present in the dry film/face mask at a total concentration of at least 0.00001 wt. %, or at least 0.0001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, or at least 0.1 wt. %, or at least 0.2 wt. %, or at least 0.4 wt. %, or at least 1 wt. %, or about 2 wt. %, and in some embodiments, up to 20 wt. %, or up to 18 wt. %, or up to 16 wt. %, or up to 10 wt. %, or up to 5 wt. %.

[0030] In one embodiment, the active agent includes at least one of a skin whitening or depigmenting agent and an anti-acne agent, or combinations thereof, which may be present at a concentration of at least 0.00001 wt. %, or at least 0.0001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, or at least 0.1 wt. %, or at least 0.5 wt. %, or at least 1 wt. % of the dry film, and in some embodiments, up to 10 wt. %, or up to 5 wt. %, or about 2 wt. %. The one or more active agents may be homogeneously incorporated/dispersed in the film/face mask, for example, by casting the film from a dispersion containing the TPU and active agent or by soaking the TPU in a hydrating solution containing the desired active agents and/or excipients.

[0031] One or more excipients may be present in the dry film/face mask at a total concentration of at least 0.01 wt. %, or at least 0.2 wt. %, or at least 0.4 wt. %, or at least 1 wt. %, and in some embodiments, up to 10 wt. %. The one or more

excipients may be homogeneously dispersed in the film/face mask, for example, by casting the film from a dispersion containing the TPU and active agent and/or excipient.

[0032] The hydrated film **18** (or face mask **10** formed therefrom) after swelling in an aqueous formulation for at least 10 minutes, or 30 minutes, at room temperature, may be at least 0.2 or at least 0.5 mm in thickness and in some embodiments, is up to 1.5 mm, or up to 1.2 mm, or up to 1.0 mm, or up to 0.8 mm in thickness. The hydrated film/face mask may include at least 5 wt. % of thermoplastic polyurethane polymer, or at least 10 wt. % thereof, and in some embodiments up to 25 wt. %, or up to 20 wt. %, or up to 18 wt. %, or up to 10 wt. % of the thermoplastic polyurethane polymer at room temperature. Polymers other than thermoplastic polyurethane which have a molecular weight of over 500 daltons may be present at up to 10 wt. %, or up to 5 wt. %, or up to 1 wt. %, or as little as 0% of the hydrated film/face mask. The hydrated film/face mask may include at least 30 wt. % water, or at least 50 wt. % water.

[0033] One or more of the active agents may be present in the hydrated film/face mask in a pharmaceutically effective amount. For example, the active agents may be present at a total concentration of at least 0.00001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, or at least 0.1 wt. %, or at least 0.2 wt. %, or at least 0.5 wt. %, or at least 1 wt. %.

[0034] In one embodiment, the active agent includes a skin whitening or depigmenting agent, e.g., at a concentration of at least 0.00001 wt. %, or at least 0.1 wt. %, or at least 0.2 wt. % of the hydrated film/face mask. In one embodiment, the active agent includes an anti-acne agent, e.g., at a concentration of at least 0.1 wt. % or at least 0.2 wt. % of the hydrated film/face mask.

[0035] One or more excipients may be present in the hydrated film/face mask at a total concentration of at least 0.01 wt. %, or at least 0.1 wt. %, or at least 0.5 wt. %, or at least 1 wt. %, and in some embodiments, up to 50 wt. %.

[0036] A ratio by weight of the total amount of active agents to the exemplary thermoplastic polyurethane polymer in the dry film, hydrated film, and/or face mask may be at least 1:100,000, or at least 1:10,000 or at least 1:1000, or at least 1:200, or at least 1:100, or at least 1:50 and may be up to 1:5.

[0037] As an example, the hydrated film/face mask includes at least 5 wt. %, and/or up to 30 wt. %, or up to 20 wt. % of (what was) the dry film, at least one active agent at a total concentration of at least 0.0001 wt. %, or at least 0.001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, or at least 0.2 wt. %, optionally at least one excipient, and at least 30 wt. %, or at least 50 wt. %, or at least 60 wt. %, or at least 70 wt. %, or at least 80 wt. % water, and in some embodiments, up to 95% water or up to 90% water.

[0038] The hydrated film **18** and contoured face mask **10** formed therefrom are clear and flexible and have the ability to conform and adhere to the contours of the face and body. The hydrated film also has “drape” or “cling” type characteristics that enable them to hold on to the skin even when the face is in an upright position. The film is capable of maintaining film integrity over time, such as for at least 30 minutes or at least 1 hour, and in some cases, for days, weeks, or months under standard storage conditions.

[0039] The hydrated film may have high clarity when wet. The hydrated film is generally stronger than hydrocolloid films of the same thickness and thus can be free of all reinforcing materials, such as woven or non-woven fabric or mesh. Thinner sheets can also be used than for hydrocolloid films. The exemplary face mask **10** is free of reinforcing materials.

[0040] The hydrated TPU film when tested for wet burst strength may have higher absolute peak force at break and greater % elongation than hydrocolloid films of the same thickness. This facilitates stretching of the film around facial or other body features without ripping and allows it to be handled easily.

[0041] The film may be solvent cast or extruded. In one embodiment, the film is solvent cast with or without the active agent **12**. For example, the exemplary thermoplastic polyurethanes can be formed into granules which can be easily solubilized in alcohol/water mixtures and cast to form monolithic thin films **18**. As an alcohol, ethanol and isopropanol may be used. As an alternative to alcohol, tetrahydrofuran, dimethylacetamide, dimethylformamide, or other water-miscible non-aqueous solvents can be used. The granules can also be extruded to form thin films **18**. The films may be cast or extruded onto a release layer.

[0042] Being formed of a single layer **18** of material renders the face mask relatively inexpensive to produce. The active agent may be incorporated into the

film prior to hydration (e.g. during solvent casting, during the hydration process, or after partial hydration, allowing customers to tailor the active agents to their particular treatments. For example, a cosmetic solution includes water, optionally a moisturizer/humectant, such as glycerin, and one or more (additional) active agents. Dry films of the TPU, on the release layer, may be soaked in a selected hydrating solution containing the selected active agents and excipients. The hydrated film may be shaped to form the face **10** mask, for example, by punching out the cavities **16** for the eyes, nose, and mouth. The hydrated face mask, containing the selected active agents and excipients, may be packaged in a foil pouch. These steps may be performed at different locations, for example, the dry film may be shipped to a facial mask manufacturer who may select and add the hydrating solution. This method eliminates the need for reinforcing the face mask using a mesh, fabric, or other substrate.

[0043] While the thin film finds particular use in facial masks, it may be used for applying an active agent to any part of the body, for example to apply an active agent to a wound.

The Thermoplastic Polyurethane

[0044] The unhydrated polyurethane film **18** includes, as a significant component (at least 30 wt. %, or at least 50 wt. %, or at least 80 wt. %), a thermoplastic polyurethane which includes a hard segment and a soft segment and optionally an intermediate segment.

[0045] In one embodiment, the thermoplastic polyurethane (denoted TPU1) includes a soft segment which is derived from a first high molecular weight polyether polyol (Polyol A) and a second high molecular weight polyether polyol (Polyol B) of lower molecular weight than the first polyol. Polyols A and B may be of the general form $\text{HO}-(\text{R}^1(\text{R}^2)\text{O})_n-\text{H}$, where:

R^1 is selected from C_2 – C_4 alkylene groups and mixtures thereof, such as $-\text{CH}_2\text{CH}-$ and $-\text{CH}_2\text{CH}_2\text{CH}-$,

R^2 is a side group and is selected from H and C_1 – C_2 alkyl groups and mixtures thereof, and

n is an integer which represents the average number of ether units by weight in each polyol, and where n is at least 20.

[0046] A ratio of the value of n for the first polyol to the value of n for the second polyol may be at least 1.5:1 or at least 2:1, or at least 3:1, or at least 4:1, and may be up to 20:1 or up to 10:1. The value of n for Polyol A may be at least 60 or at least 100 or at least 150 and may be up to 500 or up to 240. The value of n for Polyol B may be at least 25, or at least 30, and may be up to 50 or up to 45.

[0047] All molecular weights mentioned herein are weight average molecular weights and are expressed in daltons, unless otherwise noted. Polyol A may have an average molecular weight of at least 3000, or at least 4000, or at least 6000 daltons, and in some embodiments, up to 15,000, or up to 12,000, or up to 10,000 daltons. Polyol B may have an average molecular weight of no more than 2500, or no more than 2000, or no more than 1600 daltons, and in some embodiments, at least 800 daltons or at least 1000 daltons. A ratio of the molecular weight of Polyol A to polyol B may be at least 1.4:1 or at least 2:1 and may be up to 15:1 or up to 10:1, or up to 8:1. The soft segment thus has a bimodal distribution of average length of the polyether segments.

[0048] A molar ratio of Polyol B to Polyol A in the reaction mixture for forming the thermoplastic urethane may be at least 5:1 or at least 8:1 such as up to 20:1.

[0049] A weight ratio of Polyol B to Polyol A in forming the thermoplastic urethane may be from 1:1 to 5:1, such as at least 1.5:1, or at least 1:1.

[0050] The hard segment may be derived from a diisocyanate, and at least one of a diisocyanate and a chain extender. The chain extender may also be a polyol, such as a C_1 - C_{20} or C_1 - C_{12} , or C_2 - C_{10} alkyl and/or aryl polyol. A molecular weight of the chain extender may be up to 300 daltons, or up to 250 daltons, or up to 200 daltons.

[0051] An optional intermediate segment may be derived from a third polyol (Polyol C) and a diisocyanate (in general, the same as is used for generating the hard segment). Polyol C may be a polyether polyol as for Polyols A and B, but where n is at least 3 or at least 5, or at least 7, and may be up to 20 or up to 12. A molecular weight of Polyol C may be at least 200, or at least 250, or at least 300 daltons and may be up to 800 or up to 500, or up to 400 daltons.

[0052] An example thermoplastic polyurethane is the reaction product of: 20–30 wt. % Polyol A, 40–70 wt. % Polyol B, 5–20 wt. % polyisocyanate, 0–5 wt. % Polyol C, 0.2–5 wt. % chain extender, optionally, one or more additional polymer forming

components, and optionally up to 2 wt. % of a catalyst (totaling 100 wt. %). In combination, Polyols A and B may comprise at least 50 wt. %, or at least 70 wt. % of the total weight of polymer forming components in the reaction mixture.

[0053] The thermoplastic polyurethane may have a weight average molecular weight of from about 50,000 to about 1,000,000 daltons, or from about 75,000 to about 500,000, or from about 100,000 to about 300,000 daltons.

[0054] In another embodiment a thermoplastic polyurethane composition (TPU2) is as described for TPU1 but includes Polyol A but not Polyol B. In another embodiment a thermoplastic polyurethane composition (TPU3) is as described for TPU1 but includes Polyol B but not Polyol A. Blends of two or more of the thermoplastic polyurethanes TPU1, TPU2, and TPU3 are also contemplated. A weight ratio of TPU1:TPU2 and/or TPU3 may be at least 1:2. In one embodiment, the ratio is at least 1:1.5, or at least 1:1, or at least 2:1, and may be up to 100:1, or higher, such as up to 20:1, or up to 10:1.

[0055] The exemplary thermoplastic polyurethane is optionally blended in the dry film with one or more additional polymers. Additional polymers suitable for use herein include thermoplastic polyurethanes and cross-linked poly(acrylic acid) polymers.

[0056] Example cross-linked poly(acrylic acid) polymers include those that are cross-linked with an alkyl ether of pentaerythritol or an alkyl ether of sucrose. Suitable cross-linked poly(acrylic acid) polymers are available under the trade name Carbopol® from Lubrizol Advanced Materials, Inc. Examples include Carbopol® 934, Carbopol® 940, Carbopol® 941, Carbopol® 980, and Carbopol® 981, Carbopol® 981F and Carbopol® ETD 2020 polymers. A weight ratio of TPU : cross-linked poly(acrylic acid) polymer(s) may be at least 5:1, or at least 10:1, or at least 20:1, or at least 40:1, or at least 50:1 and may be up to 1000:1 or up to 100:1, such as about 60:1, where the TPU can include one or more of TPUs 1, 2, and 3.

[0057] The proportions of hard segment, soft segment, and intermediate segment in the TPU may be calculated as follows:

[0058] Wt. % soft segment = wt. % polyols having a molecular weight of at least 250 daltons.

[0059] Wt. % hard segment = wt. % isocyanate in hard segment + wt. % chain extender: low molecular weight diol (less than 200 daltons) or other chain extender.

[0060] Wt. % intermediate segment = 100 – wt. % soft segment – wt. % hard segment.

[0061] Wt. isocyanate in hard segment = [moles isocyanate – moles polyols having a molecular weight of at least 250 daltons] × Mw isocyanate.

5 **[0062]** In one embodiment, the hard segment content (calculated as above) in the TPU is at least 4 wt. %, or at least 4.3 wt. %. The hard segment content in the TPU may be up to 12 wt. %, or up to 10 wt. %, or up to 9 wt. %.

[0063] In one embodiment, the soft segment content (calculated as above) in the TPU is at least 75 wt. %, or at least 80 wt. %. The soft segment content in the
10 TPU may be up to 94 wt. %, or up to 92 wt. %. In one embodiment, the TPU is 9-11 wt. % hard segment, 84-88 wt. % soft segment, and the balance (e.g., 3-4 wt. %) intermediate segment. In one embodiment, the TPU is 4.5-11 wt. % hard segment, 84-91 wt. % soft segment, and the balance (e.g., 2.5-4 wt. %) is intermediate segment.

15 Polyols A, B, and C

[0064] Suitable hydroxyl terminated polyether polyols which are useful as Polyols A and B, and optionally Polyol C are derived from a diol or polyol having a total of, for example, from 2 to 15 carbon atoms, such as an alkyl diol or glycol, which is reacted with an ether comprising an alkylene oxide of, for example, from 2
20 to 6 carbon atoms, such as ethylene oxide, propylene oxide or a mixture thereof. For example, polyether polyols can be produced by first reacting propylene glycol with propylene oxide followed by subsequent reaction with ethylene oxide. Primary hydroxyl groups resulting from ethylene oxide are more reactive than secondary hydroxyl groups and thus are often more suitable.

25 **[0065]** Example polyether polyols include poly(ethylene glycol) formed by reaction of ethylene oxide with ethylene glycol, poly(propylene glycol) formed by reaction of propylene oxide with propylene glycol, a copolymer of ethylene oxide and a C₃ to C₁₅ alkylene oxide, in particular, a C₃ to C₆ alkylene oxide, such as poly(propylene glycol), e.g., a copolymer polyol comprising poly(propylene glycol)
30 and poly(ethylene oxide) segments, poly(tetramethylene ether glycol) formed by reaction of water with tetrahydrofuran, which can also be described as polymerized tetrahydrofuran, and which is commonly referred to as PTMEG. Suitable polyether

polyols also include polyamide adducts of an alkylene oxide and can include, for example, ethylenediamine adduct formed by reaction of ethylenediamine with propylene oxide, diethylenetriamine formed by reaction of diethylenetriamine with propylene oxide, and similar polyamide type polyether polyols.

- 5 **[0066]** Copolyethers can also be utilized in the described compositions. Typical copolyethers include the reaction product of THF and ethylene oxide; THF and propylene oxide; or ethylene oxide and propylene oxide. The first two are available from BASF as PolyTHF™ B, a block copolymer, and PolyTHF™ R, a random copolymer. The third is available as PolyG™ 55-56 from Lonza.

10 Chain Extender

[0067] The exemplary TPU composition is made using a chain extender (chain lengthening agent). Chain extenders include diols, diamines, and combinations thereof. The chain extender may have a molecular weight of up to 500 daltons or up to 300 daltons, such as at least 46 daltons.

- 15 **[0068]** One or more short chain polyols having from 2 to 20, or 2 to 12, or 2 to 10 or 2–8 carbon atoms may be used as chain extenders in the polyurethane forming composition to increase the molecular weight of the polyurethane. Examples of chain extenders include lower aliphatic polyols and short chain aromatic glycols having molecular weights of less than 500 or less than 300.
- 20 Suitable chain extenders include organic diols (including glycols) having a total of from 2 to about 20 carbon atoms such as alkane diols, cycloaliphatic diols, alkylaryl diols, and the like. Exemplary alkane diols include ethylene glycol, diethylene glycol, 1,3–propanediol, 1,3–butanediol, 1,4–butanediol, (BDO), 1,3–butanediol, 1,5–pentanediol, 2,2–dimethyl–1,3–propanediol, propylene glycol, dipropylene glycol, 1,6–hexanediol, 1,7–heptanediol, 1,9–nonanediol, 1,10–decanediol, 1,12–
- 25 dodecanediol, tripropylene glycol, triethylene glycol, and 3–methyl–1,5–pentanediol. Examples of suitable cycloaliphatic diols include 1,2–cyclopentanediol, and 1,4–cyclohexanedimethanol (CHDM). Examples of suitable aryl and alkylaryl diols include hydroquinone di(β–hydroxyethyl)ether (HQEE), 1,2–
- 30 dihydroxybenzene, 1,3–dihydroxybenzene, 1,4–dihydroxybenzene, 1,2,3–trihydroxybenzene, 1,2–di(hydroxymethyl)benzene, 1,4–di(hydroxymethyl)benzene, 1,3–di(2–hydroxyethyl)benzene, 1,2–di(2–hydroxyethoxy)benzene, 1,4–di(2–

hydroxyethoxy)benzene, bisethoxy biphenol, 2,2-di(4-hydroxyphenyl)propane (i.e., bisphenol A), bisphenol A ethoxylates, bisphenol F ethoxylates, 4,4-isopropylidenediphenol, 2,2-di[4-(2-hydroxyethoxy)phenyl]propane (HEPP), and mixtures thereof and the like.

5 **[0069]** Mixtures of one or more of the above chain extenders can also be utilized.

[0070] Chain extenders with functionality greater than 2 may be used so long as the resulting TPU retains its thermoplasticity. Examples of such chain extenders include trimethylolpropane (TMP), glycerin and pentaerythritol. Generally, the
10 addition of such chain extenders should not exceed 10% relative to the weight of the difunctional chain extenders.

[0071] In one embodiment, the chain extender is selected from 1,4-butanediol, and 1,10-decanediol.

[0072] Chain extenders can also be based on diamines. Exemplary diamines
15 may have molecular weights of less than 500, and include, for example, as ethylenediamine, diethylenediamine, tetramethylenediamine, hexamethylenediamine, diethylenetriamine triethylenetetramine, tetraethylenepentamine, pentaethylenehexamine, piperazine, morpholine, substituted morpholine, piperidine, substituted piperidine, 2-amino-1-
20 ethylpiperazine hydrazine, 1,4-cyclohexanediamine, and mixtures thereof. Alkanolamines, such as ethanolamine, diethanolamine, and triethanolamine, may also be used. Further examples of chain lengthening agents include aniline, and the like.

[0073] The molar amount or ratio of the total hydroxyl groups of the one or more
25 chain extenders utilized to the total hydroxyl groups of Polyols A, B, and C may be from about 0.1 to about 5.0, or from about 0.2 to about 4.0, or from about 0.4 to about 2.5.

Polyisocyanate

[0074] The polyisocyanate includes one or more polyisocyanates. Suitable
30 polyisocyanates include aromatic diisocyanates, aliphatic diisocyanates, and mixtures thereof.

[0075] In order to form relatively long linear polyurethane chains, di-functional or polyfunctional isocyanates are utilized. In one embodiment, one or more diisocyanates are utilized. The polyisocyanates useful herein generally have a formula $R(NCO)_n$, where n is at least 2. R can be an aromatic, a cycloaliphatic, an aliphatic, or combinations thereof having from 2 to about 20 carbon atoms.

[0076] Examples of aromatic diisocyanates include 4,4'-diphenylmethane diisocyanate (MDI), m-xylene diisocyanate (XDI), phenylene-1,4-diisocyanate, naphthalene-1,5-diisocyanate, 2,4-toluene diisocyanate (2,4-TDI), 2,6-toluene diisocyanate (2,6-TDI), 1,4-phenylene diisocyanate, 1,3-phenylene diisocyanate, 3,3'-dimethoxy-4,4'-biphenylene diisocyanate, 3,3'-dimethyl-4,4'-biphenylene diisocyanate (TODI), 4,4'-diisocyanate-diphenyl ether, 2,4-naphthalene diisocyanate, 1,5-naphthalene diisocyanate, 1,3-xylene diisocyanate, 1,4-xylene diisocyanate.

[0077] Examples of aliphatic diisocyanates include isophorone diisocyanate (IPDI), 1,4-butane diisocyanate (BDI), tetramethylene diisocyanate, hexamethylene diisocyanate (HDI), 1,4-cyclohexyl diisocyanate (CHDI), decane-1,10-diisocyanate, lysine diisocyanate (LDI), isophorone diisocyanate (PDI), 1,5-naphthalene diisocyanate (NDI), 4,4'-diisocyanato dicyclohexylmethane (H12MDI), 1,3-diisocyanate methylcyclohexane, 1,4-diisocyanate methylcyclohexane, 4,4'-diisocyanate dicyclohexane, 4,4'-diisocyanato dicyclohexylmethane, and isomers, dimers, trimers and mixtures thereof.

[0078] In one embodiment, the isocyanate is selected from cycloaliphatic and aromatic diisocyanates. In one specific embodiment, the isocyanate is selected from MDI and H12MDI.

[0079] Suitable polyisocyanates are commercially available from companies such as Bayer Corporation of Pittsburgh, Pa., The BASF Corporation of Parsippany, N.J., The Dow Chemical Company of Midland, Mich., and Huntsman Chemical of Utah.

[0080] The molecular weight of the polymers described herein are determined by gel permeation chromatography (GPC) calibrated with a poly(methyl methacrylate) (PMMA) standard. Number average molecular weights are measured by GPC using a PL-GPC 220 high temperature GPC instrument manufactured by Polymer Laboratories (Varian, Inc.). Approximately 0.02 g polymer sample is

dissolved in 5 ml of dimethyl acetamide (DMAc), containing 250 ppm of butylated hydroxytoluene (BHT) and 0.05 molar NaNO_3 . The test sample solution is gently shaken for about two hours and filtered by passing the sample solution through a 0.45 μm PTFE disposable disc filter. The chromatographic conditions are: Mobile
5 phase: DMAc, with 250 ppm BHT and 0.05 M NaNO_3 , 70°C, 1.0 ml/min. Sample size: 100 μl Column set: PLgel (Guard + 2 x Mixed-A), all 10 μm , in series. Waters Empower Pro LC/GPC software is used to analyze the results and to calculate M_n . The weight average and number weight average molecular weights of the polymers described herein are obtained by integrating the area under the peak
10 corresponding to the polymer, which is normally the major high molecular weight peak, excluding peaks associated with diluents, impurities, and other additives.

Catalyst

[0081] One or more polymerization catalysts may be present during the polymerization reaction. Generally, any conventional catalyst can be utilized to
15 react the diisocyanate with the polyol intermediates and/or the chain extender. Examples of suitable catalysts which in particular accelerate the reaction between the NCO groups of the diisocyanates and the hydroxy groups of the polyols and chain extenders include organic tin compounds such as dibutyltin diacetate, dibutyltin dilaurate (DBTL), dioctyltin dilaurate (DOTDL), and dibutyltin
20 bis(ethoxybutyl 3-mercaptopropionate); titanate acid; organic titanium compounds such as tetraisopropyl titanate, tetra-n-butyl titanate, polyhydroxytitanium stearate and titanium acetylacetonate; tertiary amines such as triethylene diamine, triethylamine N-methylmorpholine, *N,N,N',N'*-tetramethylethylenediamine, *N,N,N',N'*-tetramethylhexamethylene diamine, triethylamine, *N,N'*-
25 dimethylpiperazine, *N,N*-dimethylaminoethanol, dimethylcyclohexylamine, and diazabicyclo[2.2.2]octane; and mixtures of two or more thereof.

[0082] The total amount of the catalyst used may be from 0.0001 to 0.1 part by weight per 100 parts by weight of the polyols A, B, and C.

Other Additives

30 **[0083]** Various types of optional components can be present during the polymerization reaction, and/or incorporated into the TPU described above to improve processing and other properties. These additives include antioxidants,

such as phenolic types, organic phosphites, phosphines and phosphonites, hindered amines, organic amines, organo-sulfur compounds, lactones and hydroxylamine compounds, biocides, fungicides, antimicrobial agents, compatibilizers, electro-dissipative or anti-static additives, fillers and reinforcing agents, such as titanium dioxide, alumina, clay and carbon black, flame retardants, such as phosphates, halogenated materials, and metal salts of alkyl benzenesulfonates, impact modifiers, such as methacrylate-butadiene-styrene ("MBS") and methyl methacrylate/butyl acrylate ("MBA"), mold release agents such as waxes, fats and oils, pigments and colorants, plasticizers, polymers, rheology modifiers such as monoamines, polyamide waxes, silicones, and polysiloxanes, slip additives, such as paraffinic waxes, hydrocarbon polyolefins and/or fluorinated polyolefins, and UV stabilizers, which may be of the hindered amine light stabilizers (HALS) and/or UV light absorber (UVA) types. Other additives may be used to enhance the performance of the TPU composition or blended product. All of the additives described above may be used in an effective amount customary for these substances.

[0084] These additional additives can be incorporated into the components of, or into the reaction mixture for, the preparation of the TPU resin, or after making the TPU resin. In another process, all the materials can be mixed with the TPU resin and then melted or they can be incorporated directly into the melt of the TPU resin.

Active Agents

[0085] The hydrated polyurethane film includes one or more active agents. One or more excipients may also be present. One or more of the active agents and/or excipients may be introduced to the preformed dry film in a hydrating composition, such as water, an alcohol or other organic solvent, combination thereof, or the like. In another embodiment, one or more of the active agents and/or excipients is combined with the polyurethane polymer to form a casting solution and cast together to form a polyurethane polymer film, which may be then dried to form the dry polyurethane film.

[0086] Active agents useful herein may be categorized or described herein by their therapeutic and/or cosmetic benefit or their postulated mode of action or function. However, it is to be understood that the active and other ingredients

useful herein can, in some instances, provide more than one cosmetic and/or therapeutic benefit or function 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 an ingredient to the particularly stated application or applications listed.

[0087] Active agents useful herein may be delivered to the surface of the skin, known as the stratum corneum, may be delivered to the underlying portions of the skin known as the dermis and epidermis. Active agents may also be medicinal drug substances which penetrate through the initial layers of the skin to the underlying tissue, in this respect the active agents may have local effect and are not systemic. Active agents may also have percutaneous absorption and have a systemic effect where the active agent is considered a medicinal drug substance and after absorption is transported via the blood to the body systemically.

[0088] The active agents may be selected from skin whitening or depigmenting agents, anti-acne agents, anti-wrinkle and/or anti-aging agents, pain management agents, agents stimulating healing, emollients, AQP-3 modulating agents, aquaporin modulating agents, proteins from the aquaporin family, collagen synthesis stimulating agents, agents modulating PGC-1- α synthesis, agents modulating the activity of PPAR γ , agents which increase or reduce the triglyceride content of adipocytes, agents stimulating or delaying adipocyte differentiation, lipolytic agents or agents stimulating lipolysis, anti-cellulite agents, adipogenic agents, inhibitors of acetylcholine-receptor aggregation, agents inhibiting muscle contraction, anticholinergic agents, elastase inhibiting agents, matrix metalloproteinase inhibiting agents, melanin synthesis stimulating or inhibiting agents, propigmenting agents, self-tanning agents, NO-synthase inhibiting agents, 5 α -reductase inhibiting agents, lysyl- and/or prolyl hydroxylase inhibiting agents, antioxidants, free radical scavengers and/or agents against atmospheric pollution, reactive carbonyl species scavengers, anti-glycation agents, antihistamine agents, antiviral agents, antiparasitic agents, skin conditioners, humectants, substances which retain moisture, alpha hydroxy acids, beta hydroxy acids, moisturizers, hydrolytic epidermal enzymes, vitamins, amino acids, proteins, biopolymers, gelling polymers, agents able to reduce or treat the bags under the eyes, exfoliating

agents, desquamating agents, keratolytic agents, antimicrobial agents, antifungal agents, fungistatic agents, bactericidal agents, bacteriostatic agents, agents stimulating the synthesis of dermal or epidermal macromolecules and/or capable of inhibiting or preventing their degradation, elastin synthesis-stimulation agents, 5 decorin synthesis-stimulation agents, laminin synthesis-stimulation agents, defensin synthesis-stimulating agents, chaperone synthesis-stimulating agents, cAMP synthesis-stimulating agents, heat shock proteins, HSP70 synthesis stimulators, heat shock protein synthesis-stimulating agents, hyaluronic acid synthesis-stimulating agents, fibronectin synthesis-stimulating agents, sirtuin 10 synthesis-stimulating agents, agents stimulating the synthesis of lipids and components of the stratum corneum (ceramides, fatty acids), agents that inhibit collagen degradation, agents that inhibit elastin degradation, agents that inhibit serine proteases, agents stimulating fibroblast proliferation, agents stimulating keratinocyte proliferation, agents stimulating adipocyte proliferation, agents 15 stimulating melanocyte proliferation, agents stimulating keratinocyte differentiation, agents that inhibit acetylcholinesterase, skin relaxant agents, glycosaminoglycan synthesis-stimulating agents, antihyperkeratosis agents, comedolytic agents, anti-psoriasis agents, anti-dermatitis agents, anti-eczema agents, DNA repair agents, DNA protecting agents, stabilizers, anti-itching agents, agents for the treatment 20 and/or care of sensitive skin, firming agents, redensifying agents, restructuring agents, anti-stretch mark agents, binding agents, agents regulating sebum production, antiperspirant agents, coadjuvant healing agents, agents stimulating reepithelialization, coadjuvant reepithelialization agents, cytokine growth factors, cytokine growth factors, agents which act on capillary circulation and/or 25 microcirculation, 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, chelating agents, 30 plant extracts, essential oils, marine extracts, agents obtained from a biofermentation process, mineral salts, cell extracts, sunscreens and organic or mineral photoprotective agents active against ultraviolet A and/or B rays, and mixtures thereof.

Skin Whitening and Depigmenting Agents

[0089] Exemplary skin-whitening or depigmenting agents include hydrogen peroxide, pyridine-3-carboxamide (nicotinamide), kojic acid, hydroquinine, mulberry root extract, liquorice root extract, *Scutellaria baicalensis* extract, grape extract, 5 ferulic acid, hinokitiol, arbutin, α -arbutin (bearberry extract), and mixtures thereof. extracts of *Achillea millefolium*, *Aloe vera*, *Azadirachta indica*, *Osmunda japonica*, *Artocarpus incisus*, *Bidens pilosa*, *Broussonetia papyrifera*, *Chlorella vulgaris*, *Cimicifuga racemosa*, *Embllica officinalis*, *Glycyrrhiza glabra*, *Glycyrrhiza uralensis*, *Ilex purpurea*, *Ligusticum lucidum*, *Ligusticum wallichii*, *Mitracarpus scaber*, 10 *Morinda citrifolia*, *Morus alba*, *Morus bombycis*, *Naringi crenulata*, *Prunus domestica*, *Pseudostellaria heterophylla*, *Rumex crispus*, *Rumex occidentalis*, *Sapindus mukorossi*, *Saxifraga sarmentosa*, *Scutellaria galericulata*, *Sedum sarmentosum* Bunge, *Stellaria medica*, *Triticum Vulgare*, *Arctostaphylos uva ursi* or *Withania somnifera*, flavonoids, soy extract, lemon extract, orange extract, ginkgo 15 extract, cucumber extract, geranium extract, bearberry (gayuba) extract, carob extract, cinnamon extract, marjoram extract, rosemary extract, clove extract, soluble liquorice extract, blackberry leaf extract, Lipochroman-6™ [INCI: dimethylmethoxy chromanol] and Chromabright™ [INCI: dimethylmethoxy chromanyl palmitate] marketed by Lipotec, Actiwhite™ LS 9808 [INCI: water, 20 glycerin, sucrose dilaurate, polysorbate 20, *Pisum sativum* (pea) extract] and Dermawhite® NF LS 9410 [INCI: mannitol, arginine HCl, phenylalanine, disodium EDTA, sodium citrate, kojic acid, citric acid, yeast extract] marketed by Laboratoires Serobiologiques/Cognis, Lumiskin™ [INCI: caprylic/capric triglyceride, diacetyl-boldine], Melaclear™ [INCI: glycerin, water, dithiaoctanediol, gluconic acid, 25 sutilains, beta-carotene], O.D.A.white™ [INCI: octadecenedioic acid] and Etioline™ [INCI: glycerin, butylene glycol, *Arctostaphylos uva ursi* leaf extract, *Mitracarpus scaber* extract] marketed by Sederma, Sepiwhite™ MSH [INCI: undecylenoyl phenylalanine] marketed by Seppic, Achromaxyl™ [INCI: water, *Brassica napus* extract] marketed by Vincience, Gigawhite™ [INCI: water, glycerin, *Malva sylvestris* (mallow) extract, *Mentha piperita* leaf extract, *Primula veris* extract, *Alchemilla vulgaris* extract, *Veronica officinalis* extract, *Melissa officinalis* leaf extract, *Achillea millefolium* extract], Melawhite® [INCI: leukocyte extract, AHA] or Melfade®-J [INCI: 30 water, *Arctostaphylos uva-ursi* leaf extract, glycerin, magnesium ascorbyl

phosphate] marketed by Pentapharm, Albatin[®] [INCI: 1-aminoethylphosphinic acid, butylene glycol, water] marketed by Exsymol, Tyrostat[™]-11 [INCI: water, glycerin, *Rumex occidentalis* extract] and Melanostatine[®]-5 [INCI: dextran, nonapeptide-1] marketed by Atrium Innovations, arbutin and its isomers, kojic acid and derivatives thereof, ascorbic acid and derivatives thereof such as 6-*O*-palmitoylascorbic acid, ascorbyl glucoside, dipalmitoyl ascorbic acid, sodium ascorbyl phosphate (NAP), magnesium ascorbyl phosphate (MAP), aminopropyl ascorbyl phosphate, ascorbyl glucoside or ascorbyl tetraisopalmitate (VCIP); retinol and derivatives thereof including tretinoin and isotretinoin, idebenone, hydroxybenzoic acid and derivatives thereof, niacinamide, liquiritin, resorcinol and derivatives thereof, hydroquinone, α -tocopherol, γ -tocopherol, azelaic acid, potassium azeloyl diglycinate, resveratrol, linoleic acid, α -lipoic acid, dihydrolipoic acid, α -hydroxy acids, β -hydroxy acids, ellagic acid, ferulic acid, cinnamic acid, oleanolic acid, aloesin and its derivatives, serine protease inhibitors, for example tryptase, trypsin and PAR-2 inhibitors, and mixtures thereof.

Anti-Acne Agents

[0090] Exemplary anti-acne agents include salicylic acid, glycolic acid, lactobionic acid, azelaic acid, benzoyl peroxide, antibiotics such as Clindamycin, sodium sulfacetamide and erythromycin, retinoids such as adapalene, tazarotene, and tretinoin, which may be sold under trade names such as Retin-A, Differin[™], Renova[™], and Tazorac[™], and mixtures thereof.

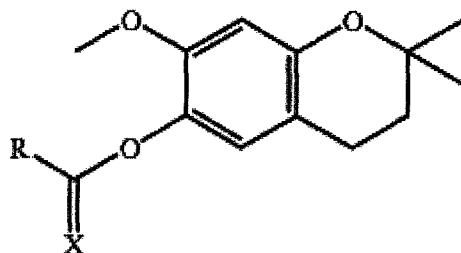
Anti-Wrinkle and/or Anti-Aging Agents

[0091] Exemplary anti-wrinkle agents and/or anti-aging agents include extracts or hydrolyzed extracts of *Vitis vinifera*, *Rosa canina*, *Curcuma longa*, *Iris pallida*, *Theobroma cacao*, *Ginkgo biloba*, *Leontopodium alpinum*, *Dunaliella salina*, synthetic compounds or products, such as Matrixyl[®] [INCI: palmitoyl pentapeptide-4], Matrixyl[®] 3000 [INCI: palmitoyl tetrapeptide-7, palmitoyl oligopeptide], Essenskin[™] [INCI: calcium hydroxymethionine], Renovage[™] [INCI: teprenone] or Dermaxyl[™] [INCI: palmitoyl oligopeptide] marketed by Sederma/Croda, Vialox[™] [INCI: pentapeptide 3], Syn[®]-Ake [INCI: dipeptide diaminobutyroyl benzylamide diacetate], Syn[®]-Coll [INCI: palmitoyl tripeptide-5], Phytaluronate[™] [INCI: locust

bean (*Ceratonia siliqua*) gum] or Preregen™ [INCI: Glycine soja (soybean) protein, oxidoreductases] marketed by Pentapharm/DSM, Myoxinol™ [INCI: hydrolyzed *Hibiscus esculentus* extract], Syniorage™ [INCI: acetyl tetrapeptide-11], Dermican™ [INCI: acetyl tetrapeptide-9] or DN AGE™ LS [INCI: *Cassia alata* leaf extract] marketed by Laboratoires Serobiologiques/Cognis, Algisium C™ [INCI: methylsilanol mannuronate] or Hydroxyprolisilane CN™ [INCI: methylsilanol hydroxyproline aspartate] marketed by Exsymol, Argireline™ [INCI: acetyl hexapeptide-8], SNAP-7 [INCI: acetyl heptapeptide-4], SNAP-8 [INCI: acetyl octapeptide-3], Leuphasyl® [INCI: pentapeptide-18], Inyline™ [INCI: acetyl hexapeptide-30], Aldenine® [INCI: hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide 1], Preventhelia® [INCI: diaminopropionoyl tripeptide-33], Decorinyl™ [INCI: tripeptide-10 citrulline], Trylagen® [INCI: Pseudoalteromonas ferment extract, hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide 10 citrulline, Tripeptide 1], Eyeseryl® [INCI: acetyl tetrapeptide-5], Peptide AC29 [INCI: acetyl tripeptide-30 citrulline], Relistase™ [INCI: acetylgarginyltryptophyl diphenylglycine], Thermostressine™ [INCI: acetyl tetrapeptide-22], Lipochroman 6 [INCI: dimethylmethoxy chromanol], Chromabright™ [INCI: dimethylmethoxy chromanyl palmitate], Antarcticine® [INCI: Pseudoalteromonas ferment extract], dGlyage™ [INCI: lysine HCl, lecithin, tripeptide-9 citrulline], Vilastene™ [INCI: lysine HCl, lecithin, tripeptide-10 citrulline] or Hyadisine™ [INCI: Pseudoalteromonas ferment extract] marketed by Lipotec, Kollaren™ [INCI: tripeptide 1, dextran] marketed by Institut Européen de Biologie Cellulaire, Collaxyl™ IS [INCI: hexapeptide-9], Laminixyl IS™ [INCI: heptapeptide], Orsirtine™ GL [INCI: *Oryza sativa* (rice) extract], D'Orientine™ IS [INCI: *Phoenix dactylifera* (Date) seed extract], Phytoquintescine™ [INCI: Einkorn (*Triticum monococcum*) extract] or Quintescine™ IS [INCI: dipeptide-4] marketed by Vincience/ISP, BONT-L-Peptide [INCI: palmitoyl hexapeptide-19] marketed by Infinitec Activos, Deepaline™ PVB [INCI: palmitoyl hydrolyzed wheat protein] or Sepilift™ DPHP [INCI: dipalmitoyl hydroxyproline] marketed by Seppic, Gatuline™ Expression [INCI: *Acmella oleracea* extract], Gatuline™ In-Tense™ [INCI: *Spilanthes acmella* flower extract] and Gatuline™ Age Defense 2 [INCI: *Juglans regia* (walnut) seed extract] marketed by Gattefossé, Thalassine™ [INCI: algae extract] marketed by Biotechmarine, ChroNOLine™ [INCI: caprooyl tetrapeptide-3]

and Thymulen-4™ [INCI: acetyl tetrapeptide-2] marketed by Atrium Innovations/Unipex Group, EquiStat™ [INCI: *Pyrus malus* fruit extract, glycine soja seed extract] or Juvenesce [INCI: octyldodecanol, caprylic/capric triglyceride, Retinol, ursolic acid, BHT, butylene glycol, ilomastat] marketed by
 5 Coletica/Engelhard/BASF, Ameliox™ [INCI: carnosine, tocopherol, *Silybum marianum* fruit extract] and PhytoCellTec™ *Malus domestica* [INCI: *Malus domestica* fruit cell culture] marketed by Mibelle Biochemistry, Bioxilift™ [INCI: *Pimpinella anisum* extract] and SMS Anti-Wrinkle™ [INCI: *Annona squamosa* seed extract] marketed by Silab, antagonists of the Ca²⁺ channel, such as alverine,
 10 manganese or magnesium salts, certain secondary or tertiary amines, retinol and its derivatives, idebenone and its derivatives, Coenzyme Q10 and its derivatives, boswellic acid and its derivatives, GHK and its derivatives and/or salts, carnosine and its derivatives, chloride channel agonists, and mixtures thereof.

[0092] For example, U.S. Patent No. 8,110,207 describes compound of general



15 formula (I) , (6-substituted 7-methoxy-2,2-dimethylchromanes), and cosmetically or pharmaceutically acceptable salts, wherein R is a linear or branched, saturated or unsaturated aliphatic group containing 2 to 23 carbon atoms, or a cyclic group, and which can contain substituents selected from hydroxy, alkoxy, amino, carboxyl, cyano, nitro,
 20 alkylsulfonyl or halogen atoms; and X is selected from O and S.

Moisturizing Agents, Humectants, Substances that Retain Moisture, and Emollients

[0093] Exemplary moisturizing agents, humectants and emollients include sodium pyrrolidone carboxylate; betaines, such as *N,N,N*-trimethylglycine; yeast
 25 extract; polyols and polyethers such as glycerin, ethylhexylglycerin, caprylyl glycol, pentylene glycol, butylene glycol, propylene glycol and their derivatives, triethylene glycol, polyethylene glycol, Glycereth-26, Sorbeth-30; panthenol; pyroglutamic

acid and its salts and derivatives; amino acids, such as serine, proline, alanine, glutamate or arginine; ectoine and its derivatives; *N*-(2-hydroxyethyl)acetamide; *N*-lauroyl-pyrrolidone carboxylic acid; *N*-lauroyl-L-lysine; *N*-alpha-benzoyl-L-arginine; urea; creatine; α - and β -hydroxy acids such as lactic acid, glycolic acid, malic acid, citric acid or salicylic acid, and their salts, such as sodium lactate and lactic acid bacteria fermented solution; polyglyceryl acrylate; sugars and polysaccharides, such as glucose, saccharide isomerate, sorbitol, pentaerythritol, inositol, xylitol, trehalose and derivatives thereof, sodium glucuronate, carraghenates (*Chondrus crispus*) and chitosan; glycosaminoglycans such as hyaluronic acid and derivatives thereof such as sodium hyaluronate; aloe vera in any of its forms; honey; soluble collagen; lecithin and phosphatidylcholine; ceramides; cholesterol and its esters; tocopherol and its esters, such as tocopheryl acetate or tocopheryl linoleate; long-chain alcohols such as cetearyl alcohol, stearyl alcohol, cetyl alcohol, oleyl alcohol, isocetyl alcohol or octadecan-2-ol; long-chain alcohol esters such as lauryl lactate, myristyl lactate or C₁₂-C₁₅ alkyl benzoates; fatty acids such as stearic acid, isostearic acid or palmitic acid; polyunsaturated fatty acids (PUFAs); sorbitans such as sorbitan distearate; glycerides such as glyceryl monoricinoleate, glyceryl monostearate, glyceryl stearate citrate or caprylic and capric acid triglyceride; saccharose esters such as saccharose palmitate or saccharose oleate; butylene glycol esters, such as dicaprylate and dicaprinate; fatty acid esters such as isopropyl isostearate, isobutyl palmitate, isocetyl stearate, isopropyl laurate, hexyl laurate, decyl oleate, cetyl palmitate, di-*n*-butyl sebacate, isopropyl myristate, isopropyl palmitate, isopropyl stearate, butyl stearate, butyl myristate, isopropyl linoleate, 2-ethylhexyl palmitate, 2-ethylhexyl cocoate, decyl oleate, myristyl myristate; squalene; mink oil; lanolin and its derivatives; acetylated lanolin alcohols; silicone derivatives such as cyclomethicone, dimethicone or dimethylpolysiloxane; Antarcticine® [INCI: Pseudoalteromonas Ferment extract] or acetyl-glutamyl-methionyl-alanyl-isoleucine, acetyl-arginyl-phenylglycyl-phenylglycine or acetyl-arginyl-6-aminohexanoyl-alanine marketed by Lipotec, petrolatum; mineral oil; mineral and synthetic waxes; beeswax (*Cera alba*); paraffin; or waxes and oils with vegetable origins such as candelilla wax (*Euphorbia cerifera*), carnauba wax (*Copernicia cerifera*), shea butter (*Butirospermum parkii*), cocoa butter (*Theobroma cacao*),

castor oil (*Ricinus communis*), sunflower oil (*Helianthus annuus*), olive oil (*Olea europaea*), coconut oil (*Cocos nucifera*), palm oil (*Elaeis guineensis*), wheat germ oil (*Triticum vulgare*), sweet almond oil (*Prunus amygdalus dulcis*), musk rose oil (*Rosa moschata*), soya bean oil (*Glycine soja*), grape seed oil (*Vitis vinifera*),
 5 calendula oil (*Calendula officinalis*), jojoba oil (*Simmondsia chinensis*), mango oil (*Mangifera indica*), avocado oil (*Persea gratissima*), and mixtures thereof.

Anti-inflammatory Agents

[0094] Exemplary anti-inflammatory agents include seal whip extract, *Polygonum cuspidatum* root extract, allantoin, madecassoside extract, echinacea
 10 extract, amaranth seed oil, sandal wood oil, peach tree leaf extract, extract of *Aloe vera*, *Arnica montana*, *Artemisia vulgaris*, *Asarum maximum*, *Calendula officinalis*, *Capsicum*, *Centipeda cunninghamii*, *Chamomilla recutita*, *Crinum asiaticum*, *Hamamelis virginiana*, *Harpagophytum procumbens*, *Hypericum perforatum*, *Lilium candidum*, *Malva sylvestris*, *Melaleuca alternifolia*, *Origanum majorana*, *Origanum vulgare*, *Prunus laurocerasus*, *Rosmarinus officinalis*, *Salix alba*, *Silybum marianum*, *Tanacetum parthenium*, *Thymus vulgaris*, *Uncaria guianensis* or
 15 *Vaccinium myrtillus*, spike moss extract, lysozyme chloride, mometasone furoate, prednisolone, nonsteroidal anti-inflammatories including loxoprofen sodium, flurbiprofen, diclofenac sodium, tiaramide hydrochloride, cyclooxygenase or
 20 lipoxygenase inhibitors, benzydamine, acetylsalicylic acid, rosmarinic acid, ursolic acid, glycyrrhizic acid and sodium, potassium and ammonium salts thereof, α -bisabolol, azulene and analogues, sericoside, ruscogenin, escin, scoline, rutin and analogues, hydrocortisone, clobetasol, dexamethasone, prednisone, paracetamol, amoxiprin, benorilate, choline salicylate, faislamine, methyl salicylate, magnesium
 25 salicylate, salsalate, diclofenac, aceclofenac, acetaminophen, bromfenac, etodolac, indomethacin, oxametacin, proglumetacin, sulindac, tolmetin, ibuprofen, dexibuprofen, carprofen, fenbufen, fenoprofen, flurbiprofen, ketoprofen, dexketoprofen, ketorolac, loxoprofen, naproxen, miroprofen, oxaprozin, pranoprofen, tiaprofenic acid, suprofen, mefenamic acid, meclofenamate,
 30 meclofenamic acid, flufenamic acid, tolafenamic acid, nabumetone, phenylbutazone, azapropazone, clofezone, kebufone, metamizole, mofebutazone, oxyphenbutazone, phenazone, sulfinpyrazone, piroxicam, lornoxicam, meloxicam,

tenoxicam, celecoxib, etoricoxib, lumiracoxib, parecoxib, rofecoxib, valdecoxib, nimesulide, naproxcinod, fluproquazone or licofelone, omega-3 and omega-6 fatty acids, morphine, codeine, oxycodone, hydrocodone, diamorphine, pethidine, tramadol, buprenorphine, benzocaine, lidocaine, chloroprocaine, tetracaine, procaine, amitriptyline, carbamazepine, gabapentin, pregabalin, bisabolol, Neutragen™ [INCI: water, butylene glycol, dextran, palmitoyl tripeptide-8] marketed by Atrium Innovations/Unipex Group, Meliprene® [INCI: dextran, Acetyl Heptapeptide-1] marketed by Institut Européen de Biologie Cellulaire/Unipex Group, Skinasensyl™ [INCI: acetyl tetrapeptide-15] or Anasensyl™ [INCI: mannitol, ammonium glycyrrhizate, caffeine, Hippocastanum (Horse Chestnut) extract] marketed by Laboratoires Serobiologiques/Cognis, Calmosensine™ [INCI: acetyl dipeptide-1] marketed by Sederma, coenzyme Q10 or alkylglyceryl ethers, and mixtures thereof.

DNA Repair Agents

[0095] Exemplary DNA repair agents include C₁-C₈ alkyl tetrahydroxycyclohexanoate, micrococcus lysate, bifida ferment lysate, DNA repair enzymes such as photolyase and T4 endonuclease V, and mixtures thereof.

Skin Lipid Barrier Repair Agents

[0096] Exemplary skin lipid barrier repair agents include phytosphingosine, linoleic acid, cholesterol, and mixtures thereof.

Anti-Cellulite Agents

[0097] Exemplary anti-cellulite agents include *Coleus forskohlii* root extract, *Magnolia grandiflora* bark extract, *Nelumbo nucifera* leaf extract, and mixtures thereof.

Wound Healing Agents

[0098] Exemplary wound-healing agents, coadjuvant healing agents, agents stimulating re-epithelialization and/or coadjuvant re-epithelialization agents include extracts of *Aristolochia clematis*, *Centella asiatica*, *Rosa moschata*, *Echinacea angustifolia*, *Symphytum officinale*, *Equisetum arvense*, *Hypericum perforatum*, *Mimosa tenuiflora*, *Persea gratissima*, *Prunus africana*, *Tormentilla erecta*, *Aloe*

vera, soybean protein, Polyplant[®] Epithelizing [INCI: *Calendula officinalis*, *Hypericum perforatum*, *Chamomilla recutita*, *Rosmarinus officinalis*] marketed by Provital, Cytokinol[®] LS 9028 [INCI: hydrolyzed casein, hydrolyzed yeast protein, lysine HCl] marketed by Laboratories Serobiologiques/Cognis or Deliner[®] [INCI: Zea May (Corn) Kernel extract] marketed by Coletica/Engelhard/BASF, allantoin, cadherins, integrins, selectins, hyaluronic acid receptors, immunoglobulins, fibroblast growth factor, connective tissue growth factor, platelet-derived growth factor, vascular endothelial growth factor, epidermal growth factor, insulin-like growth factor, keratinocyte growth factors, colony-stimulating factors, transforming growth factor beta, tumor necrosis factor alpha, interferons, interleukins, matrix metalloproteinases, cytokines, extra cellular matrices such as collagen I, II, and III, receptor protein tyrosine phosphatases, Antarcticine[®] [INCI: *Pseudoalteromonas* ferment extract], Decorinyl[®] [INCI: Tripeptide-10 citrulline], Trylagen[®] [INCI: *Pseudoalteromonas* ferment extract, hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide-10 citrulline, Tripeptide-1], Bodyfensine[™] [INCI: acetyl dipeptide-3 aminohexanoate], marketed by Lipotec, and mixtures thereof.

Muscle Relaxants, agents inhibiting muscle contraction, agents inhibiting acetylcholine receptor clustering and anticholinergic agents

[0099] Exemplary muscle relaxants, agents inhibiting muscle contraction, agents inhibiting acetylcholine receptor clustering and anticholinergic agents include extracts of *Atropa belladonna*, *Hyoscyamus niger*, *Mandragora officinarum*, *Chondrodendron tomentosum*, plants of the *Brugmansia* genus, or the *Datura* genus, *Clostridium botulinum* toxin, peptides derived from the protein SNAP-25 or Inyline[™] [INCI: acetyl hexapeptide-30] marketed by Lipotec, baclofen, carbidopa, levodopa, bromocriptine, chlorphenesin, chlorzoxazone, donepezil, mephenoxalone, reserpine, tetrabenazine, dantrolene, thiocolchicoside, tizanidine, clonidine, procyclidine, glycopyrrolate, atropine, hyoscyamine, benztropine, scopolamine, promethazine, diphenhydramine, dimenhydrinate, dicyclomine, cyclobenzaprine, orphenadrine, flavoxate, cyclopentolate, ipratropium, oxybutynin, pirenzepine, tiotropium, trihexyphenidyl, tolterodine, tropicamide, solifenacin, darifenacin, mebeverine, trimethaphan, atracurium (besylate), cisatracurium, doxacurium, fazadinium, metocurine, mivacurium, pancuronium, pipecuronium,

rapacuronium, tubocurarine, dimethyl tubocurarine, rocuronium, vecuronium, suxamethonium, 18-methoxycoronaridine, carisoprodol, febarbamate, meprobamate, metocarbamol, phenprobamate, tibamate, anticonvulsant agents such as levetiracetam, stiripentol, phenobarbital, methylphenobarbital, pentobarbital, metharbital, barbitone, primidone, carbamazepine, oxcarbazepine, benzodiazepines, for example clonazepam, clobazam, lorazepam, diazepam, flutoprazepam, lorazepam, midazolam, nitrazepam, nimetazepam, phenazepam, temazepam, tetrazepam, clobazam, hydrochloric acid epihydrochloride, talipexole hydrochloride, tolperisone hydrochloride, and mixtures thereof.

Pain Management Agents

[0100] Exemplary pain management agents and local anesthetics include lidocaine and salts such as lidocaine hydrochloride, bupivacaine and bupivacaine hydrochloride, mepivacaine and mepivacaine hydrochloride, etidocaine, prilocaine and prilocaine hydrochloride, tetracaine, procaine, chloroprocaine, benzocaine, and their salts; counterirritant agents that mask pain such as menthol, camphor, methylsalicylate, cinnamaldehyde, capsaicin and mixtures thereof, acetylsalicylic acid (aspirin) and other salicylic acid esters, diclofenac and salts thereof such as sodium, diethylamine, ibuprofen, ketoprofen, acetaminophen and other non-steroidal anti-inflammatory drugs, analgesic drugs such as morphine hydrochloride, fentanyl citrate, buprenorphine hydrochloride, and the like, and mixtures thereof.

Hair Growth Retardation and Stimulation Agents

[0101] Exemplary hair growth retardation agents include ursolic acid, *Boswellia serrata* extract, activin and activin agonists, flavonoids such as quercetin, curcumin, galangin, fisetin, myricetin, apigenin; propyl gallate, nordihydroguaiaretic acid, caffeic acid, tyrosine kinase inhibitors such as lavendustin, erbstatin, tyrphostins, benzoquinone-ansamycin herbimycin A, thiazolidinediones, phenazocine, 2,3-dihydro-2-thioxo-1H-indol-3-alkanoic acids, phenothiazine derivatives such as thioridazine; sphingosine and derivatives thereof such as phytosphingosine; staurosporine and derivatives thereof, glycyrrhetic acid, lauryl isoquinolinium bromide, Decelerine™ [INCI: lauryl isoquinolinium bromide,

Pseudoalteromonas ferment extract] marketed by Lipotec, serine protease inhibitors, trypsin, and mixtures thereof.

[0102] Exemplary hair growth stimulating agents include *Serenoa serrulata* fruit extract, licorice extract, *Tussilago farfara* or *Achillea millefolium*, nicotinic acid esters such as C₃–C₆ alkyl nicotines such as methyl or hexyl nicotinate, benzyl nicotinate, or tocopheryl nicotinate; biotin, 5 α -reductase-inhibiting agents, anti-inflammatory agents, retinoids, for example all-*trans*-retinoic acid or tretinoin, isotretinoin, retinol or vitamin A, and derivatives thereof, such as zinc salt of acetate, palmitate, propionate, motretinide, etretinate and *trans*-retinoate; anti-bacterial agents, calcium channel blockers, for example cinnarizine and diltiazem; hormones, for example estriol and its analogues and thyroxine and its analogues and/or salts; antiandrogenic agents, for example oxendolone, spironolactone and diethylstilbestrol; anti-radical agents, esterified oligosaccharides, for example those described in documents EP 0211610 and corresponding U.S. 4,761,401 and EP 0064012 and corresponding U.S. 4607025; derivatives of hexosaccharic acids, for example glucosaccharic acid or those described in EP 0375388 and corresponding U.S. 5,081,151; glucosidase inhibitors, for example D-glucaro-1,5-lactam and those described in document EP 0334586 and corresponding U.S. 4,975,441; glycosaminoglycanase and proteoglycanase inhibitors, for example L-galactono-1,4-lactone and those described in document EP 0277428 and corresponding U.S. 5,015,470; tyrosine kinase inhibitors, for example 1-amido-1-cyano(3,4-dihydroxyphenyl)ethylene and those described in document EP 0403238 and corresponding U.S. 5,124,354, diazoxides, for example 7-(acetylthio)-4',5'-dihydrospiro[androst-4-ene-17,2'-(3H)furan]-3-one, 1,1-dioxide of 3-methyl-7-chloro[2H]-1,2,4-benzothiadiazine and spirooxazine; phospholipids, for example lecithin; salicylic acid and derivatives thereof, hydroxycarboxylic and keto carboxylic acids and esters thereof, lactones and their salts; anthralin, eicosa-5,8,11-trienoic acids and esters thereof and amides among others, minoxidil and derivatives, acetyl glucosamine, and mixtures thereof.

Agents for reducing Bags under the Eyes

[0103] Exemplary agents for reducing bags under the eye and dark circles include hesperidin methyl chalcone, dipeptide-2, *Passiflora incarnate* flower

extract, linoleic acid, isolinoleic acid, peptides as described in U.S. 20100098769, and mixtures thereof.

Collagen Synthesis or Blood Circulation Enhancing Agents

[0104] Exemplary collagen synthesis or blood circulation enhancing agents include arginine, *Ascophyllum nodosum* extract, *Asparagopsis armata* extract, and mixtures thereof.

Antioxidants

[0105] Exemplary antioxidants include nordihydroguaiaretic acid, butylhydroxyanisole (BHA), butylhydroxytoluene (BHT), propyl gallate, erythorbic acid, sodium erythorbate, para-hydroxyanisole, *tert*-butylhydroquinone (TBHQ), 2,6-di-*tert*-butyl-4-methylphenol, gallic acid esters such as propyl gallate and octyl gallate, probucol, polyphenols, ascorbic acid and its salts, enzymes such as catalase, superoxide dismutase and peroxidases; citric acid, citrates, monoglyceride esters, calcium metabisulfite, lactic acid, malic acid, succinic acid, tartaric acid, vitamin A or β -carotene, vitamins E and C, tocopherols such as vitamin E acetate, ascorbic acid esters such as ascorbyl palmitate and ascorbyl acetate, zinc, copper, mannitol, reduced glutathione, carotenoids such as cryptoxanthin, astaxanthin and lycopene; cysteine, uric acid, carnitine, taurine, tyrosine, lutein, zeaxanthin, *N*-acetyl-cysteine, carnosine, γ -glutamylcysteine, quercetin, lactoferrin, dihydrolipoic acid, tea catechins, retinyl palmitate and derivatives thereof, bisulfate, metabisulfite and sodium sulfite, chromans, chromenes and their analogues, Lipochroman-6 [INCI: Dimethylmethoxy Chromanol], chelating agents of metals such as EDTA, sorbitol, phosphoric acid or dGlyageTM [INCI: Lysine HCl, Lecithin, Tripeptide-9 Citrulline]; extract of *Ginkgo Biloba*, plant extracts such as sage, pomegranate, rosemary, oregano, ginger, marjoram, cranberry, grape seed, tomato, green leaf tea and black leaf tea; oleoresin extract, extract of plants which contain phenols such as vanillin, ellagic acid and resveratrol; tertiary butylhydroquinone or mixtures thereof, metal salts with a valence of 2 such as selenium, cadmium, vanadium or zinc; α -lipoic acid, coenzyme Q, idebenone and derivatives thereof, and mixtures thereof.

Antihistamine Agents

[0106] Exemplary antihistamine agents include chlorpheniramine maleate, promethazine hydrochloride, cetirizine hydrochloride, and mixtures thereof.

UV Absorbers

5 **[0107]** Exemplary ultraviolet ray absorbers and agents capable of filtering UV rays include benzophenone derivatives such as 2,4-dihydroxybenzophenone, organic and mineral photoprotective agents active against A and/or B ultraviolet rays such as substituted benzotriazoles, substituted diphenylacrylates, organic nickel complexes, umbelliferone, urocanic acid, biphenyl derivatives, stilbene, 3-
 10 benzylidene camphor, and derivatives thereof such as 3-(4-methylbenzylidene)camphor; 4-aminobenzoic acid and derivatives thereof, 2-ethylhexyl 4-(dimethylamino)benzoate, 2-octyl 4-(dimethylamino)benzoate and amyl 4-(dimethylamino)benzoate; cinnamic acid derivatives such as benzyl cinnamate, cinnamic acid esters, such as 2-ethylhexyl 4-methoxycinnamate and
 15 diethylamino hydroxybenzoyl hexyl benzoate, propyl 4-methoxycinnamate, isoamyl 4-methoxycinnamate, 2-ethylhexyl-2-cyano-3,3-diphenyl cinnamate (octocrylene); salicylic acid derivatives such as benzyl salicylate and salicylic acid esters, such as 2-ethylhexyl salicylate, 4-isopropylbenzyl salicylate, homomenthyl salicylate; benzophenone derivatives, such as 2-hydroxy-4-
 20 methoxybenzophenone, 2-hydroxy-4-methoxy-4'-methylbenzophenone, and 2,2'-dihydroxy-4-methoxybenzophenone; benzalmalonic acid esters, such as di-2-ethylhexyl 4-methoxybenzalmalonate; triazine derivatives, such as 2,4,6-trianilino-(*p*-carbo-2'-ethyl-1'-hexyloxy)-1,3,5-triazine, octyl triazone or diethylhexyl butamido triazone; propane-1,3-diones, such as 1-(4-*tert*-butylphenyl)-3-(4'-
 25 methoxyphenyl)propane-1,3-dione; ketotricyclo(5.2.1.0)decane derivatives; 2-phenylbenzimidazole-5-sulfonic acid; benzophenone sulfonic acid derivatives, such as 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid and its salts; 4-(2-oxo-3-bornylidenemethyl)benzenesulfonic acid, benzoyl methane derivatives, such as benzoyl methane 2-methyl-5-(2-oxo-3-bornylidene)sulfonic acid, such as 1-
 30 (4'-*tert*-butylphenyl)-3-(4'-methoxyphenyl)propane-1,3-dione, 4-*tert*-butyl-4'-methoxydibenzoylmethane, 1-phenyl-3-(4'-isopropylphenyl)-propane-1,3-dione, enamine compounds, anthranilates, silicones, benzimidazole derivatives,

imidazolines, benzoyl derivatives, Chromabright™ [INCI: dimethylmethoxy chromanyl palmitate] and Preventhelia® [INCI: diaminopropionoyl tripeptide-33] both marketed by Lipotec, metal oxides such as zinc oxide, titanium, iron, zirconium, silicon, manganese, aluminum and cerium; silicates, talc, barium sulfate, zinc stearate, carbon nanotubes, and mixtures thereof.

Amino acids and their salts

[0108] Exemplary amino acids include glycine, alanine, valine, leucine, isoleucine, serine, threonine, phenylalanine, tyrosine, tryptophan, cystine, cysteine, methionine, citrulline, proline, hydroxyproline, aspartic acid, asparagine, glutamic acid, glutamine, arginine, histidine, lysine, γ -aminobutyric acid, salts thereof and mixtures thereof. Example salts include glutamate, trisodium methylglycine diacetate (e.g., Trilon® M marketed by BASF), derivatives of amino acids which contain cysteine, in particular *N*-acetyl cysteine, ergothioneine or *S*-carboxymethylcysteine, and/or mixtures thereof.

Peptides and commercial formulations containing them

[0109] Exemplary peptides and commercial mixtures which contain them some of which are mentioned elsewhere herein for particular effects, and may include wheat peptides, soybean peptide, copper peptide GHK-Cu [INCI: Tripeptide-1], acetyl-glutamyl-methionyl-alanyl-isoleucine, acetyl-arginyl-phenylglycyl-phenylglycine, Bodyfensine™ [INCI: acetyl dipeptide-3 aminohexanoate], Relistase™ [INCI: acetylarginyltryptophyl diphenylglycine], acetyl-arginyl-phenylglycyl-valyl-glycine, acetyl-arginyl-phenylglycyl-valyl-phenylglycine, diaminopropionyl-alanyl-asparaginyll-histidine, acetyl-arginyl-asparaginyll-histidyl-citrulline-amide, Aldenine® [INCI: hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide-1], Decorinyl® [INCI: tripeptide-10 citrulline], Serilesine® [INCI: hexapeptide-10], Peptide AC29 [INCI: acetyl tripeptide-30 citrulline], Vilastene™ [INCI: lysine HCl, lecithin, tripeptide-10 citrulline], dGlyage™ [INCI: Lysine HCl, Lecithin, Tripeptide-9 Citrulline], Eyeseryl® [INCI: acetyl tetrapeptide-5], Preventhelia® [INCI: diaminopropionoyl tripeptide-33], Argireline® [INCI: acetyl hexapeptide-8], SNAP-7 [INCI: acetyl heptapeptide-4], SNAP-8 [INCI: acetyl octapeptide-3], Leuphasyl® [INCI: pentapeptide-18], Trylagen® [INCI:

Pseudoalteromonas ferment extract, hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide-10 citrulline, tripeptide-1], Inyline™ [INCI: acetyl hexapeptide-30], Melatime™ [INCI: acetyl tripeptide-40], Thermostressine™ [INCI: acetyl tetrapeptide-22] and Liporeductyl® [INCI: caffeine, Butcher's broom (*Ruscus Aculeatus*) root extract, triethanolamine-hydroiodide, carnitine, Ivy (*Hedera helix*) extract, escin, tripeptide-1] marketed by Lipotec, Matrixyl® [INCI: Palmitoyl Pentapeptide-4], Matrixyl® 3000 [INCI: palmitoyl tetrapeptide-7, palmitoyl oligopeptide], Dermaxyl® [INCI: palmitoyl oligopeptide], Calmosensine™ [INCI: acetyl dipeptide-1], Biopeptide CL™ [INCI: glyceryl polymethacrylate, propylene glycol, palmitoyl oligopeptide] and Biopeptide EL™ [INCI: palmitoyl oligopeptide] marketed by Sederma, pseudodipeptides, IP 2000 [INCI: dextran, trifluoroacetyl tripeptide-2] marketed by IEB and Atrium, Pepha®-TIMP [INCI: Human Oligopeptide-20], ECM-Protect® [INCI: Water (water), dextran, Tripeptide-2] and Melanostatine®-5 [INCI: dextran, nonapeptide-1] marketed by Atrium Innovations, TIMP-Peptide™ [proposed INCI: acetyl hexapeptide], Bronzing S.F. [proposed INCI: butyryl pentapeptide], BONT-L-Peptide [INCI: Palmitoyl Hexapeptide-19] and ECM Moduline [proposed INCI: Palmitoyl tripeptide-28] marketed by Infinitec Activos, IP2000™ [INCI: dextran, Trifluoroacetyl tripeptide-2] marketed by Institut Européen de Biologie Cellulaire, Syn®-Coll [INCI: Palmitoyl Tripeptide-5] marketed by Pentapharm, Neutrazen™ [INCI: Water, butylene Glycol, dextran, Palmitoyl Tripeptide-8], Chronoline™ [INCI: Caprooyl Tetrapeptide-3] and Thymulen-4 [INCI: Acetyl Tetrapeptide-2] marketed by Atrium Innovations/Unipex Group, Meliprene® [INCI: dextran, Acetyl Heptapeptide-1] and Melitane® [INCI: Acetyl Hexapeptide-1] marketed by Institut Européen de Biologie Cellulaire/Unipex Group, Skinasensyl™ [INCI: Acetyl Tetrapeptide-15] marketed by Laboratoires Serobiologiques/Cognis, Vialox® [INCI: Pentapeptide-3], Syn®-Ake® [INCI: Dipeptide Diaminobutyroyl Benzylamide Diacetate], Syn®-Coll [INCI: Palmitoyl Tripeptide-5], Syniorage™ [INCI: Acetyl Tetrapeptide-11], Dermican™ [INCI: Acetyl Tetrapeptide-9] marketed by Laboratoires Sérobiologiques/Cognis, Kollaren® [INCI: Tripeptide-1, dextran] marketed by Institut Européen de Biologie Cellulaire, Collaxyl® IS [INCI: Hexapeptide-9], Laminixyl IS™ [INCI: Heptapeptide], Quintescine™ IS [INCI: Dipeptide-4], UCPeptide™ V [INCI: Pentapeptide] and AT Peptide™ IS [INCI: Tripeptide-3] marketed by Vincience/ISP, glutathione,

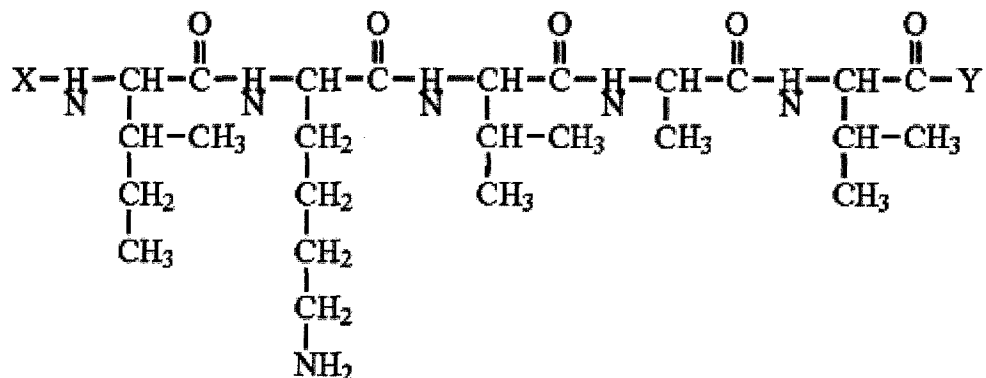
carnosine and/or mixtures thereof; and peptides of pharmaceutical use, such as glucagon, leuprolide, goserelin, triptorelin, buserelin, nafarelin, deslorelin, histrelin, avorelin, abarelix, cetorelix, ganirelix, degarelix, desmopressin, somatostatin and analogues of somatostatin such as octreotide, vapreotide and lanreotide, among
5 others.

[0110] Specific examples of peptides include those described in the following U.S. Publications, patents, and international applications, where in each case, R₁ and R₂ are respective N and C peptide terminating groups which are generally not α-amino acids, examples of which are given in the respective patent documents:

[0111] U.S. 6,169,074, which describes an isolated excitation-secretory uncoupling peptide (ESUP) for inhibiting neurotransmitter secretion from neuronal cells, consisting of the amino acid sequence of SEQ. ID. NO.: 4 (170–EIDTQNRQIDRIMEKADSNKTRIDEANQRATKMLGSG–206, which is the amino acid sequence of the substrate binding domain of SNAP–25), SEQ. ID. NO.: 7 (170–
15 EIDTQNRQIDRIMEKADSNK–189, which is the amino acid sequence of ESUP/E20h), SEQ. ID. NO.: 8 (181–IMEKADSNKTRIDEANQRATKMLGSG–206, which is the amino acid sequence of ESUP/E26h), SEQ. ID. NO.: 9 (87–SNKTRIDEANQRATKMLGSG–206, the amino acid sequence of ESUP/A20h), and SEQ. ID. NO.: 12 (Gln-Asn-Arg-Gln-Ile-Asp-Arg-Ile-Met-Glu-Lys-Ala-Asp-Ser-Asn-
20 Lys, the amino acid sequence of an ESUP derived from SNAP–25). All residues correspond to substrate binding domain residues.

[0112] U.S. 7,015,192 and 7,473,679, which describe peptides having a sequence at least 3 and no more than 30 adjacent amino acids from the amino end of protein SNAP–25 and which is useful as neuronal exocytosis inhibitor, in
25 particular, the synthetic peptide whose complete amino acid sequence is selected from the amino acid sequence of SEQ ID NO: 2 (Glu Glu Met Gln Arg Arg) and the amino acid sequence of SEQ ID NO: 3 (Glu Leu Glu Glu Met Gln Arg Arg Ala Asp Gln Leu Ala). The N-terminus of the peptide may be acetylated and the amino acid at the C-terminus of the peptide may be amidated.

[0113] U.S. 7,943,156, which describes peptides capable of increasing firmness of skin and delaying aging of skin. These XIKVAV peptides of general formula (III):
30 X–SEQ ID NO. 1–Y:



5

[0114] U.S. 20100021510, which describes a peptide capable of regulating neuronal exocytosis, of the general formula (IV): R_1-AA-R_2 its stereoisomers, mixtures thereof, and its cosmetically and pharmaceutically acceptable salts, wherein AA is a sequence of a least 3 and up to 40 adjacent amino acids contained

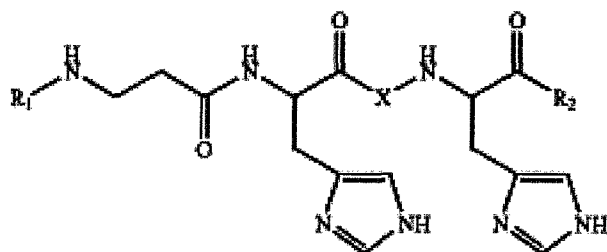
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MAEDADMRNELEEMQRRADQL, ADESLESTRRMLQLVEESKDAGI,
ELEEMQRRADQLA, ELEEMQRRADQL, ELEEMQRRADQ, ELEEMQRRAD,
ELEEMQRRRA, ELEEMQRR, LEEMQRRADQL, LEEMQRRADQ, LEEMQRRAD,
LEEMQRRRA, LEEMQRR, EEMQRRADQL, EEMQRRADQ, EEMQRRAD,
EEMQRRRA, EEMQRR, LESTRRMLQLVEE, NKDMKEAEKNLT, KNLTDL,
IMEKADSNKTRIDEANQRATKMLGSG, SNKTRIDEANQRATKMLGSG,
TRIDEANQRATKMLGSG, DEANQRATKMLGSG, NQRATKMLGSG and

20

Glu Gln Val Ser Gly Ile Ile Gly Asn Leu Arg His Met Ala Leu Asp Met Gly Asn Glu
Ile Asp Thr Gln Asn Arg Gln Ile Asp Arg Ile Met Glu Lys Ala Asp Ser Asn Lys Thr
Arg Ile Asp Glu Ala Asn Gln Arg Ala Thr Lys Met Leu Gly Ser Gly.

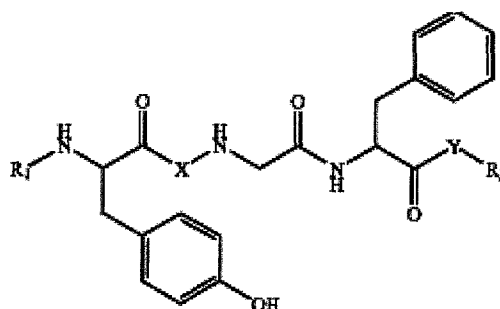
[0115] U.S. 20100098769, which describes a peptide capable of reducing or
5 removing bags formed under the eyes of general formula (V):



, its stereoisomers, mixtures thereof,
and its cosmetically and dermatopharmaceutically acceptable salts, where X is
selected from cysteinyl, seryl, threonyl and aminobutyryl.

[0116] U.S. 20110002969, which describes a peptide which includes only four
10 amino acids and which is capable of inhibiting the activity of matrix
metalloproteinases, of general formula (VI): $R_1-AA_1-AA_2-AA_3-AA_4-R_2$,
stereoisomers thereof, mixtures thereof and cosmetically or pharmaceutically
acceptable salts thereof, wherein: AA_1 is -Arg-; AA_2 is selected from -His- and -
Asn-; AA_3 is selected from -His- and -Arg-; AA_4 is -Cit-, Specific examples
15 include R_1 -Arg-His-His-Cit- R_2 , R_1 -Arg-Asn-Arg-Cit- R_2 , and stereoisomers,
mixtures thereof and/or cosmetic or pharmaceutical acceptable salts thereof.

[0117] U.S. 20090155317, which describes a peptide which includes only four
amino acids and which is capable of reducing facial wrinkles, of general formula
(VII):



and cosmetically or dermatopharmaceutically acceptable salts thereof, wherein: X and Y are selected from natural amino acids in their L- or D-form and non-encoded amino acids. Specific examples include peptides where X is glycyl, D-alanyl or D-seryl, and/or where Y is L-methionyl or L-leucyl.

- 5 **[0118]** U.S. 20110195102, which describes a peptide of only four amino acids, which is capable of inhibiting the activity of Reactive Carbonyl Species (RCS) with general formula (VIII): $R_1-AA_1-AA_2-AA_3-AA_4-R_2$, its stereoisomers, mixtures thereof, and its cosmetically or pharmaceutically acceptable salts, wherein AA_1 is selected from -Lys-, -Orn-, -Dab-, -Dpr-, -Agl-, -3,4-dehydrolysine and -4,5-
- 10 dehydrolysine; AA_2 is -Ala-; AA_3 is selected from -Asp-, -Ala-, -Asn-, -Glu- and -Pro-; and AA_4 is -His-. Specific examples include $R_1-L-Dpr-D-Ala-L-Ala-L-His-R_2$, $R_1-L-Dpr-D-Ala-L-Pro-L-His-R_2$, $R_1-L-Dpr-L-Ala-L-Pro-L-His-R_2$, and stereoisomers, mixtures thereof and/or cosmetic or pharmaceutical acceptable salts thereof.
- 15 **[0119]** U.S. 20110300199, which describes a peptide having a maximum of seven amino acids which is capable of inhibiting elastase activity and/or stimulating collagen synthesis in the skin of general formula (IX): $R_1-W_p-X_n-AA_1-AA_2-AA_3-AA_4-Y_m-R_2$, its stereoisomers, mixtures thereof, and/or its cosmetically or pharmaceutically acceptable salts, wherein at least one of the amino acids AA_1 ,
- 20 AA_2 and AA_4 is uncoded; AA_1 is selected from -Arg-, -Phg- and -Nle- or is absent; AA_2 is selected from -Ala-, -Phg-, -Cit- and -Nle-; AA_3 is selected from -Trp-, -Val- and -Tyr-; AA_4 is selected from -Phg- and -Gly-; W, X and Y are independently selected from the group consisting of coded and uncoded amino acids; and p, n and m each range between 0 and 1. Specific examples include $R_1-L-Arg-L-Nle-L-(or\ D-)-Phg-L-Tyr-L-(or\ D-)-Phg-R_2$, $R_1-L-Arg-(or\ -L-Nle-\ or\ absent)-L-(or\ D-)-Phg-L-Tyr-L-(or\ D-)-Phg-R_2$, $R_1-L-Arg-L-(or\ D-)-Phg-L-Val-L-(or\ D-)-Phg\ (or\ -L-Gly-)-R_2$, and $R_1-L-(or\ D-)-Phg-L-(or\ D-)-Phg-L-Trp-L-(or\ D-)-Phg-R_2$, and corresponding peptides wherein at least one of W, X, and Y is present, and stereoisomers, mixtures thereof and/or cosmetic or pharmaceutical acceptable
- 25 salts thereof.-
- 30

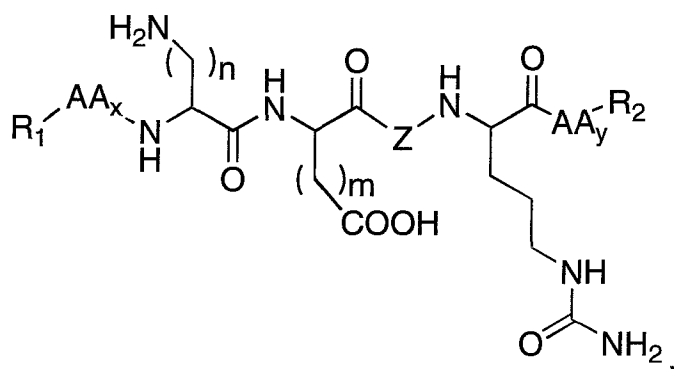
[0120] U.S. 20120021029, which describes a peptide having only three amino acids of general formula (X): $R_1-AA_1-AA_2-AA_3-R_2$, its stereoisomers, mixtures thereof and/or its cosmetic or pharmaceutical acceptable salts, wherein: AA_1 and

AA₂ are independently selected from –Tyr– and –Phe–; and AA₃ is selected from –Nle– and –Met–. Specific examples include R₁–L-Tyr–L-Tyr–L-Met–R₂, R₁–L-Tyr–L-Phe–L-Met–R₂, and R₁–L-Tyr–L-Tyr–L-Nle–R₂, and stereoisomers, mixtures thereof and/or cosmetic or pharmaceutical acceptable salts thereof.

5 **[0121]** U.S. 20120121675, which describes a peptide of general formula (XI): R₁–W_n–X_m–AA₁–AA₂–AA₃–AA₄–AA₅–AA₆–Y_p–Z_s–R₂, its stereoisomers, mixtures thereof and/or its cosmetic or pharmaceutical acceptable salts, wherein AA₁ is selected from Asp, Glu and Pro; AA₂ is Asp; AA₃ is selected from Tyr and Arg; AA₄ is selected from Phe and Tyr; AA₅ is selected from Arg and Lys; AA₆ is selected
10 from Leu and Met; W, X, Y and Z are independently selected from coded amino acids and non-coded amino acids; n, m, p and s independently have a value of between 0 and 1. Specific examples include R₁–L-Glu–L-Asp–L-Tyr–L-Tyr–L-Arg–L-Leu–R₂, R₁–L-Pro–L-Asp–L-Tyr–L-Tyr–L-Lys–L-Leu–R₂, R₁–L-Glu–L-Asp–L-Arg–L-Phe–L-Arg–L-Met–R₂, R₁–L-Glu–L-Asp–L-Tyr–L-Tyr–L-Arg–L-Met–R₂, and R₁–L-Pro–L-Asp–L-Tyr–L-Tyr–L-Arg–L-Met–R₂, and corresponding peptides wherein at
15 least one of W, X, Y and Z is present, and stereoisomers, mixtures thereof and/or cosmetic or pharmaceutical acceptable salts thereof.

[0122] U.S. 20130101662, which describes a peptide of general formula (XII): R₁–W_n–X_m–AA₁–AA₂–AA₃–AA₄–Y_p–Z_q–R₂, its stereoisomers, mixtures thereof
20 and/or its cosmetically or pharmaceutically acceptable salts, wherein: AA₁ is –His–; AA₂ is selected from the group consisting of –His–, –Leu– and –Pro–; AA₃ is –Leu–; AA₄ is selected from the group consisting of –Arg– and –Asn–; W, X, Y and Z are independently selected from amongst themselves from the group consisting of the codified amino acids and uncoded amino acids; n, m, p and q are independently
25 selected from amongst themselves and have a value between 0 and 1; n+m+p+q is less or equal to 2. Specific examples include R₁–L-His–L-Leu–L-Leu–L-Arg–R₂ and R₁–L-His–L-Pro–L-Leu–L-Arg–R₂.

[0123] U.S. 20130309281, which describes a peptide of general formula (XIII):



mixtures thereof, and cosmetically and dermatopharmaceutically acceptable salts thereof, wherein: Z is selected from the group consisting of alanyl, allo-isoleucyl, glycyl, isoleucyl, isoseryl, isovalyl, leucyl, norleucyl, norvalyl, prolyl, seryl, threonyl, 5 allo-threonyl or valyl; n and m range independently from one another between 1 and 5; AA is selected from the group consisting of natural encoded amino acids in their L- or D-form and non-encoded amino acids; x and y range independently from one another between 0 and 2. Specific examples include those where wherein Z is L-isoleucyl, L-threonyl or L-valyl and wherein x and y are 0, and stereoisomers, 10 mixtures thereof and/or cosmetic or pharmaceutical acceptable salts thereof.

[0124] U.S. 20140120141, which describes a peptide of general formula (XIV): $R_1-W_n-X_m-AA_1-AA_2-AA_3-AA_4-AA_5-AA_6-Y_p-Z_q-R_2$ its stereoisomers, mixtures thereof and/or its cosmetic or pharmaceutical acceptable salts, wherein: AA_1 is selected from the group consisting of -Ser-, -Thr- and -Tyr-; AA_2 is selected from the group consisting of -Pro- and -Val-; AA_3 is -Ala-; AA_4 is selected from the group consisting of -Glu-, -Gly- and -Val-; AA_5 is -Gly-; AA_6 is selected from the group consisting of -Gln-, -Gly-, -His- and -Pro-; W, X, Y, Z are amino acids and are independently selected from amongst themselves; n, m, p and q are independently selected from amongst themselves and have a value of 0 or 1; 15 $n+m+p+q$ is lower than or equal to 2. Specific examples include $R_1-L-Tyr-L-Pro-L-Ala-L-Glu-L-Gly-L-Gln-R_2$, $R_1-L-Ser-L-Val-L-Ala-L-Val-L-Gly-L-Gln-R_2$, and $R_1-L-Ser-L-Pro-L-Ala-L-Gly-L-Gly-L-Pro-R_2$, and stereoisomers, mixtures thereof and/or cosmetic or pharmaceutical acceptable salts thereof.

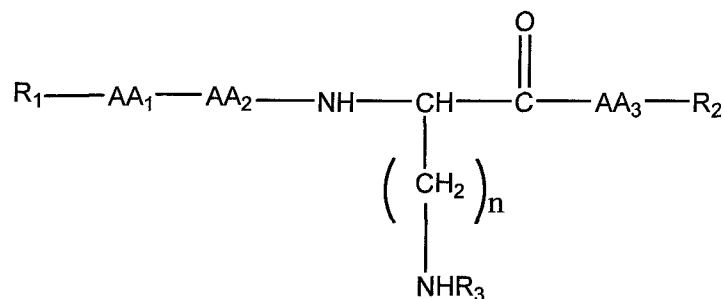
[0125] U.S. 20150183823, which describes peptides of general formula (XV): $R_1-AA_1-AA_2-AA_3-R_2$, where AA_1 is selected from -Tyr- and -Phe-, AA_2 is -Tyr-, 20 and AA_3 is selected from -Nle- and -Met-, its stereoisomers, mixtures thereof

and/or their cosmetically or pharmaceutically acceptable salts, which is suited to the treatment and/or care of conditions, disorders and/or diseases of the skin and/or hair by stimulating cyclic adenosine monophosphate synthesis (cAMP). Specific examples include R_1 -L-Tyr-L-Tyr-L-Met- R_2 , R_1 -L-Tyr-L-Phe-L-Met- R_2 ,
 5 and R_1 -L-Tyr-L-Tyr-L-Nle- R_2 , and stereoisomers, mixtures thereof and/or cosmetic or pharmaceutical acceptable salts thereof.

[0126] WO2014/086785 (and US 14/649,747; Filed June 4, 2015), which describes compounds capable of accelerating the DNA protection and repair processes of general formula (XVII):

10 $R_1-W_n-X_m-AA_1-AA_2-AA_3-AA_4-AA_5-AA_6-Y_p-Z_q-R_2$, its stereoisomers, mixtures thereof and/or its cosmetically or pharmaceutically acceptable salts, wherein AA_1 is -Tyr-; AA_2 is selected from -Asn-, -His-, -Tyr- and -Glu-; AA_3 is selected from -Lys-, -Ser- and -Pro-; AA_4 is selected from -Gly-, -Leu-, -Lys- and -His-; AA_5 is selected from -Gln- and -Asn-; AA_6 is -Val-; W, X, Y, Z are
 15 independently selected from amino acids. n, m, p and q independently have a value of 0 or 1; $n+m+p+q$ is smaller than or equal to 2.

[0127] WO2014/170347 (and US Application Ser. No. 14783689, filed October 9, 2015), which describes a compound of general formula (XVI):



20 its stereoisomers, mixtures thereof and/or its cosmetic or pharmaceutical acceptable salts, wherein AA_1 is selected from -Asp-, -Glu-, -Asn-, -Gln-, -Lys- and -Gly-, AA_2 is selected from -Val-, -Leu-, -Ile-, -Met-, -Cit-, -His-, -Thr- and -Gln-; AA_3 is selected from -Tyr-, -Trp- and 4-Abz; n is selected from 1, 2, 3 and 4, R_3 is selected from H and $-AA_2-AA_1-R_1$, R_1 is selected from H, a polymer
 25 derived from polyethylene glycol, substituted or unsubstituted non-cyclic aliphatic groups, substituted or unsubstituted alicyclyl groups, substituted or unsubstituted heterocyclyl groups, substituted or unsubstituted heteroarylalkyl groups, substituted

or unsubstituted aryl groups, substituted or unsubstituted aralkyl groups and R_6 -CO-, wherein R_6 is selected from H, substituted or unsubstituted non-cyclic aliphatic groups, substituted or unsubstituted alicyclyl groups, substituted or unsubstituted aryl groups, substituted or unsubstituted aralkyl groups, substituted or unsubstituted heterocyclyl groups and substituted or unsubstituted heteroarylalkyl groups; R_2 is selected from $-NR_4R_5$, $-OR_4$ and $-SR_4$, wherein R_4 and R_5 are independently selected from H, a polymer derived from polyethylene glycol, substituted or unsubstituted non-cyclic aliphatic group, substituted or unsubstituted alicyclyl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted heteroarylalkyl, substituted or unsubstituted aryl, and substituted or unsubstituted aralkyl; and R_1 and/or R_2 are not α -amino acids.

Vitamins

[0128] Example vitamins and factors acting like a vitamin include vitamin A and analogues thereof such as retinol and retinoic acid, carotenoids such as α -carotene and β -carotene, vitamin B₁ and analogues thereof such as thiamines, vitamin B₂ and analogues thereof such as riboflavin, vitamin B₆ and analogues thereof such as pyridoxine, vitamin B₁₂ and analogues thereof such as cyanocobalamin, folic acid, nicotinic acid, pantothenic acid, vitamin C and analogues thereof such as L-ascorbic acid, vitamin D and analogues thereof such as ergocalciferol and cholecalciferol, vitamin E and analogues thereof such as d- α -tocopherol and γ -tocopherol, Coenzyme Q10, vitamin K and analogues thereof, carnitine, ferulic acid, α -lipoic acid, orotic acid, and mixtures thereof.

[0129] In one specific embodiment, the vitamins are selected from hydrosoluble vitamins, such as vitamin C, vitamin B1, vitamin B2, vitamin B3, vitamin B5, vitamin B6, vitamin B7, vitamin B9, vitamin B12, carnitine and/or mixtures thereof.

Free radical scavengers, anti-atmospheric pollution agents, and reactive carbonyl species scavengers

[0130] Exemplary free radical scavengers and/or anti-atmospheric pollution agents, and/or reactive carbonyl species scavengers include tea extract, olive leaf extract, extract of *Rosmarinus officinalis* or extract of *Eichhornia crassipes*, benzopyrenes, vitamin C and derivatives thereof, vitamin E and derivatives thereof, in particular tocopheryl acetate, ascorbyl glycoside, phenols and polyphenols, in

particular tannins, tannic acid and ellagic acid, gallo catechol, anthocyanins, chlorogenic acid, stilbenes, indoles, cysteine-containing amino acid derivatives, in particular *N*-acetylcysteine, ergothioneine, *S*-carboxymethylcysteine, chelating agents, in particular ethylene diamine tetraacetic acid (EDTA) trisodium ethylenediamine hydroxyethyl triacetate, sodium citrate, gluconic acid, phytic acid, sodium polyphosphate, sodium metaphosphate and ethylenediamines, carotenoids, bioflavonoids, ubiquinone, idebenone, catalase, superoxide dismutase, lactoperoxidase, glutathione peroxidase, glutathione, benzylidene camphor, pidolates, lignans, melatonin, oryzanol, carnosine and derivatives thereof, GHK [INCI: tripeptide-1] and its salts and/or derivatives, Aldenine[®] [INCI: hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide-1], Preventhelia[®] [INCI: diaminopropionyl tripeptide-33], diaminopropionyl-alanyl-asparaginy-l-histidine, and Lipochroman[™]-6 [INCI: dimethylmethoxy chromanol] marketed by Lipotec, and mixtures thereof.

Hydrophilic Cosmetic, Pharmaceutical and Alimentary Active Agents

[0131] Examples of hydrophilic cosmetic, pharmaceutical and/or alimentary active agents include amino acids, peptides, proteins, hydrolyzed proteins, enzymes, hormones, vitamins, mineral salts, sugars, nucleotides, nucleic acids, molecules and extracts of biological and biotechnological origin, vaccines, synthetic or partially synthetic hydrophilic molecules and/or mixtures thereof.

[0132] Exemplary proteins, hydrolyzed protein, enzymes and hormones, as well as the commercial mixtures which contain them, include Elhibin[®] [INCI: glycine soja (soybean) protein], Preregen[®] [INCI: glycine soja (soybean) protein, oxidoreductases] and Regu[®]-Age [INCI: hydrolyzed rice bran protein, glycine soja (soybean) protein, oxidoreductases] marketed by Pentapharm/DSM, cadherins, integrins, selectins, hyaluronic acid receptors, immunoglobulins, fibroblast growth factor, connective tissue growth factor, platelet-derived growth factor, vascular endothelial growth factor, epidermal growth factor, insulin-like growth factor, keratinocyte growth factors, colony-stimulating growth factors, transforming growth factor-beta, tumor necrosis factor-alpha, interferons, interleukins, matrix metalloproteinases, receptor protein tyrosine phosphatases, hydrolyzed vegetable proteins such as hydrolyzed wheat protein, hydrolyzed soy protein or hydrolyzed

whey protein, hydrolyzed vegetable protein, Collalift® [INCI: hydrolyzed malt extract] marketed by Coletica/Engelhard, Colhibin PF® [INCI: hydrolyzed rice protein] marketed by Pentapharm, Cytokinol® LS [INCI: hydrolyzed casein, hydrolyzed yeast protein, lysine HCL] marketed by Laboratoires Serobiologiques/Cognis, Liftline® [INCI: hydrolyzed wheat protein] and Ridulisse C® [hydrolyzed soy protein] marketed by Silab, catalase, superoxide dismutase, lactoperoxidase, glutathione peroxidase, lactoprotein, casein, lactoperoxidase, lysozyme, glycosidases, stratum corneum chymotryptic enzyme (SCCE); proteases such as trypsin, chymotrypsin, sultilain, papain and bromelain; DNA repair enzymes such as photolyase or T4 endonuclease V, lipase, luteinizing hormone (LH), follicle-stimulating hormone (FSH), growth hormone, insulin, and mixtures thereof.

[0133] Exemplary extracts of biological or biotechnological origin, which can be chemically modified, as well as the commercial mixtures which contain them, include vegetable extracts, marine extracts, cell extracts and extracts produced by microorganisms.

[0134] Exemplary vegetable extracts include hydrosoluble vegetable extracts, for example hydrosoluble extracts of chamomile, ivy, lemon, ginseng, raspberry, *Roast amaranth*, *Rehmanniae radix*, gardenia, carrot, orange, peach, pineapple, gentian, hibiscus flower, walnut leaf, pumpkin, peony, quinoa, boldo, rough bindweed, salvia, pomegranate, oregano, ginger, marjoram, cranberry, grape, tomato, green tea, black tea, aloe vera (*Aloe Barbadensis*), *Sophora japonica*, papaya, pineapple, pumpkin, sweet potato, *Bupleurum chinensis*, *Cecropia obtusifolia*, *Celosia cristata*, *Centella asiatica*, *Chenopodium quinoa*, *Chrysanthellum indicum*, *Citrus aurantium amara*, *Coffea arabica*, *Coleus Forskohlii*, *Commiphora myrrha*, *Crithmum maritimum*, *Eugenia caryophyllus*, *Ginkgo biloba*, *Hedera helix* (ivy), *Hibiscus sabdariffa*, *Ilex paraguariensis*, *Laminaria digitata*, *Nelumbium speciosum*, *Paullinia cupana*, *Peumus boldus*, *Phyllacantha fibrosa*, *Prunella vulgaris*, *Prunus amygdalus dulcis*, *Ruscus aculeatus* (Butcher's broom extract), *Sambucus nigra*, *Spirulina platensis* Algae, *Uncaria tomentosa*, *Verbena Officinalis*, *Opuntia ficus- indica*, *Salix alba*, *Lupinus spp.*, *Secale cereale*, *Tussilago farfara*, *Achillea millefolium*, *Azadirachta indica*, *Osmunda japonica*, *Artocarpus incisus*, *Bidens pilosa*, *Broussonetia papyrifera*, *Chlorella vulgaris*, *Cimicifuga racemosa*, *Embllica officinalis*, *Glycyrrhiza glabra*,

Glycyrrhiza uralensis, *Ilex purpurea*, *Ligusticum lucidum*, *Ligusticum wallichii*,
Mitracarpus scaber, *Morinda citrifolia*, *Morus alba*, *Morus bombycis*, *Naringi*
crenulata, *Prunus domestica*, *Radix pseudostellaria*, *Rumex crispus*, *Rumex*
occidentalis, *Sapindus mukorossi*, *Saxifraga sarmentosa*, *Scutellaria Galericulata*,
5 *Sedum sarmentosum* Bunge, *Stellaria medica*, *Triticum Vulgare*, *Uva ursi*, *Withania*
somnifera, *Aristolochia clematis*, *Rosa moschata*, *Echinacea angustifolia*,
Symphytum officinale, *Equisetum arvense*, *Hypericum perforatum*, *Mimosa*
tenuiflora, *Persea gratissima*, *Prunus africana*, *Tormentilla erecta*, *Solanum*
tuberosum, *Rosmarinus officinalis*, *Vaccinium angustifolium*, *Macrocystis pyrifera*
10 algae, *Padina pavonica*, *Malpighia punicifolia*, *Cynara scolymus*, *Gossypium*
herbaceum, *Panicum miliaceum*, *Morus nigra*, *Sesamum indicum*, *Glycine soja*,
Triticum vulgare, *Glycine Max* (soy), malt, flax, red clover, kakkon-to, white lupine,
hazelnut, maize, beech tree shoots, *Trifolium pratense* (red clover), *Phormium*
tenax (New Zealand flax), *Cinnamomum verum*, *Laminaria saccharina*, *Spiraea*
15 *ulmaria*, Nettle Root, *Pygeum africanum*, *Avena sativa*, *Arnica montana*, *Cinchona*
succirubra, *Eugenia caryophyllata*, *Humulus lupulus*, *Hypericum perforatum*,
Mentha piperita, *Rosmarinus officinalis*, *Thymus vulgaris*, plant extract of the genus
Silybum, extract of legume seeds, extracts of red algae from the genus *Porphyra*,
Phytovityl C® [INCI: water, Zea Mays extract] marketed by Solabia, Micromerol™
20 [INCI: Pyrus Malus extract] and heather extract [INCI: *Calluna vulgaris* extract]
marketed by Coletica/Engelhard/BASF, Proteasy® TP LS8657 [INCI: *Pisum*
sativum extract] marketed by Laboratoires Sérobiologiques/Cognis, Radicaptol™
[INCI: propylene glycol, water, *Passiflora incarnata* Flower extract, *Ribes nigrum*
(blackcurrant) leaf extract, *Vitis vinifera* (grape) leaf extract] marketed by Solabia
25 and ViaPure™ *Boswellia* [INCI: olibanum (*Boswellia serrata*) extract] marketed by
Soliance, EquiStat™ [INCI *Pyrus malus* fruit extract, glycine soja seed extract]
marketed by Coletica/Engelhard, Litchiderm™ [INCI: *Litchi chinensis* pericarp
extract] and Arganyl™ [INCI: *Argania spinosa* leaf extract] marketed by
Laboratoires Sérobiologiques/Cognis, Dakaline™ [INCI: *Prunus amygdalus dulcis*,
30 *Anogeissus leiocarpus* bark extract] marketed by Soliance, Actimp 1.9.3® [INCI:
hydrolyzed lupine protein] marketed by Expanscience® Laboratoires,
Pronalen® Firming HSC [INCI: *Triticum vulgare*, *Silybum marianum*, glycine soy,
Equisetum arvense, *Alchemilla vulgaris*, *Medicago sativa*, *Raphanus sativus*] and

Polyplant[®] Firming [INCI: coneflower, *Centella asiatica*, fucus, fenugreek] marketed by Provital, Lanablue[®] [INCI: sorbitol, algae extract] marketed by Atrium Innovations, Firmiderm[®] LS 9120 [INCI: *Terminalia catappa* leaf extract, *Sambucus nigra* flower extract, PVP, tannic acid] marketed by Laboratoires
 5 Serobiologiques/Cognis, among others.

[0135] The amount of hydrophilic active ingredient contained in the face mask or body patch may be from 0.00001 to 50 wt. % of the total weight of the mask (on an unhydrated basis), such as at least 0.0001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, and may be up to 40 wt. %, or up to 30 wt. %, or up to 10 wt. %.

10 Agents inhibiting elastin degradation

[0136] Exemplary agents inhibiting elastin degradation include Elhibin[®] [INCI: glycine soja (Soybean) protein], Preregen[®] [INCI: glycine soja (soybean) protein, oxidoreductases] or Regu[®]-Age [INCI: hydrolyzed rice bran protein, glycine soja (Soybean) protein, oxidoreductases] marketed by Pentapharm/DSM, Juvenesce
 15 [INCI: ethoxydiglicol and caprylic triglyceride, retinol, ursolic acid, phytonadione, ilomastat], Micromerol[™] [INCI: *Pyrus Malus* extract], heather extract [INCI: *Calluna vulgaris* extract], Extracellium[®] [INCI: hydrolyzed potato protein] or Flavagrum[™] PEG [INCI: PEG-6 isostearate, hesperetin laurate] marketed by Coletica/Engelhard/BASF, Proteasyl[®] TP LS 8657 [INCI: *Pisum sativum* extract]
 20 marketed by Laboratoires Sérobiologiques/Cognis, Relistase[™] [INCI: acetylgarginyltryptophyl diphenylglycine] marketed by Lipotec, Sepilift[™] DPHP [INCI: dipalmitoyl hydroxyproline] marketed by Seppic, Vitaderm[®] [INCI: alcohol, water, glycerin, hydrolyzed rice protein, *Ilex aquifolium* extract, sodium ursolate, sodium oleanolate] marketed by Rahn, Gatuline[®] Age Defense 2 [INCI: *Juglans regia*
 25 (walnut) seed extract] marketed by Gattefossé, IP 2000 [INCI: dextran, trifluoroacetyl tripeptide-2] marketed by IEB and Atrium, Radicaptol[™] [INCI: propylene glycol, water, *Passiflora incarnata* flower extract, *Ribes nigrum* (blackcurrant) leaf extract, *Vitis vinifera* (grape) leaf extract] marketed by Solabia or ViaPure[™] Boswellia [INCI: olibanum (*Boswellia serrata*) extract] marketed by
 30 Soliance, and mixtures thereof.

Agents stimulating dermal or epidermal macromolecular synthesis

[0137] Exemplary agents stimulating dermal or epidermal macromolecular synthesis include agents stimulating collagen synthesis, agents stimulating elastin synthesis, agents stimulating decorin synthesis, agents stimulating laminin synthesis, agents stimulating chaperone synthesis, agents stimulating sirtuin synthesis, agents stimulating hyaluronic acid synthesis, agents stimulating aquaporin synthesis, agents stimulating fibronectin synthesis, agents inhibiting collagen degradation, agents inhibiting elastin degradation, agents inhibiting serine proteases such as leukocyte elastase or cathepsin G, agents stimulating fibroblast proliferation, agents stimulating adipocyte proliferation, agents stimulating adipocyte differentiation, agents stimulating angiogenesis, agents stimulating glycosaminoglycan synthesis, DNA repair agents and/or DNA protecting agents, for example extracts of *Centella asiatica*, *Saccharomyces cerevisiae*, *Solanum tuberosum*, *Rosmarinus officinalis*, *Vaccinium angustifolium*, extract of the algae *Macrocystis pyrifera*, *Padina pavonica*, extract of the plants soy, malt, flax, sage, red clover, kakkon-to, white lupine, hazelnut extract, corn extract, yeast extract, extract of beech tree shoots, extract of leguminosae seeds, extract of plant hormones such as gibberellins, auxins or cytokinins among others, or extract of zooplankton Salina, the product of milk fermentation with *Lactobacillus Bulgaricus*, asiaticosides and derivatives thereof, vitamin C and derivatives thereof, cinnamic acid and derivatives thereof, Matrixyl® [INCI: palmitoyl pentapeptide-3], Matrixyl® 3000 [INCI: palmitoyl tetrapeptide-3, palmitoyl oligopeptide] or Biopeptide CL™ [INCI: glyceryl polymethacrylate, propylene glycol, palmitoyl oligopeptide] marketed by Sederma, Antarcticine® [INCI: Pseudoalteromonas ferment extract], Decorinyl® [INCI: tripeptide-10 citrulline], Serilesine® [INCI: hexapeptide-10], Lipeptide [INCI: hydrolyzed vegetable protein], Aldenine® [INCI: hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide-1], Peptide AC29™ [INCI: acetyl tripeptide-30 citrulline], acetyl-arginyl-phenylglycyl-tryptophyl-phenylglycine, acetyl-arginyl-phenylglycyl-valyl-glycine, or acetyl-arginyl-phenylglycyl-valyl-phenylglycine, marketed by Lipotec, Drieline® PF [INCI: yeast betaglucan] marketed by Alban Muller, Phytovityl C® [INCI: water, Zea Mays extract] marketed by Solabia, Collalift® [INCI: hydrolyzed malt extract] marketed by Coletica/Engelhard, Phytocohesine® PSP [proposed INCI: sodium beta-sitosteryl sulfate] marketed by Seporga, minerals

such as calcium among others, retinoids and derivatives thereof, isoflavonoids, carotenoids, in particular lycopene, pseudodipeptides, retinoids and derivatives thereof such as retinol and retinyl palmitate, heparinoids, and mixtures thereof.

Matrix metalloproteinase-inhibiting agents

- 5 **[0138]** Exemplary matrix metalloproteinase-inhibiting agents include ursolic acid, isoflavones such as genistein, quercetin, carotenoids, lycopene, soy extract, cranberry extract, rosemary extract, *Trifolium pratense* (red clover) extract, *Phormium tenax* (New Zealand flax) extract, kakkon-to extract, sage extract, retinol and derivatives thereof, retinoic acid and derivatives thereof, sapogenins such as
- 10 diosgenin, hecogenin, smilagenin, sarsapogenin, tigogenin, yamogenin and yuccagenin, Collalift® [INCI: hydrolyzed malt extract], Juvenesce [INCI: ethoxydiglicol and caprylic triglyceride, retinol, ursolic acid, phytonadione, ilomastat] and EquiStat™ [INCI *Pyrus malus* fruit extract, glycine soja seed extract] marketed by Coletica/Engelhard, Pepha®-TIMP [INCI: human oligopeptide-20],
- 15 Regu®-Age [INCI: hydrolyzed rice bran protein, glycine soja protein, oxidoreductases] and Colhibin™ [INCI: hydrolyzed rice protein] marketed by Pentapharm, Lipeptide [INCI: hydrolyzed vegetable protein], Peptide AC29 [INCI: acetyl tripeptide-30 citrulline], and acetyl-arginyl-asparaginy-l-histidyl-citrulline-amide marketed by Lipotec, Litchiderm™ [INCI: *Litchi chinensis* pericarp extract]
- 20 and Arganyl™ [INCI: *Argania spinosa* leaf extract] marketed by Laboratories Sérobiologiques/Cognis, MDI Complex® [INCI: glycosaminoglycans] and ECM-Protect® [INCI: water, dextran, tripeptide-2] marketed by Atrium Innovations, Dakaline™ [INCI: *Prunus amygdalus dulcis*, *Anogeissus leiocarpus* bark extract] marketed by Soliance, Homeostatine™ [INCI: *Enteromorpha compressa*,
- 25 *Caesalpinia spinosa*] marketed by Provital, TIMP-Peptide™ [proposed INCI: acetyl hexapeptide] and ECM Moduline™ [proposed INCI: palmitoyl tripeptide] marketed by Infinitec Activos, IP2000 [INCI: dextran, trifluoroacetyl tripeptide-2] marketed by Institut Européen de Biologie Cellulaire, Actimp 1.9.3® [INCI: hydrolyzed lupine protein] marketed by Expanscience Laboratories, Vitaderm® [INCI: alcohol, water,
- 30 glycerin, hydrolyzed rice protein, ilex aquifolium extract, sodium ursolate, sodium oleanolate] marketed by Rahn, adapalene, tetracyclines and derivatives thereof such as minocycline, rolitetracycline, chlortetracycline, metacycline,

oxytetracycline, doxycycline, demeclocycline and their salts, Batimastat [BB94; [4-(*N*-hydroxyamino)-2*R*-isobutyl-3*S*-(thiophene-2-ylthiomethyl) succinyl]-*L*-phenylalanine-*N*-methanamide], Marimastat™ [BB2516; [2*S*-[*N*4(*R**),2*R**,3*S*]]-*N*4[2,2-dimethyl-1- [methylaninocarbonyl]propyl]-*N*1,2-dihydr
 5 oxy-3-(2-methylpropyl)butanediamide], and mixtures thereof.

Firming, Redensifying, and Restructuring Agents

[0139] Exemplary firming and/or redensifying and/or restructuring agents include extracts of *Malpighia punicifolia*, *Cynara scolymus*, *Gossypium herbaceum*, *Aloe Barbadensis*, *Panicum miliaceum*, *Morus nigra*, *Sesamum indicum*, *Glycine soja*,
 10 *Triticum vulgare*, Pronalen® Firming HSC [INCI: *Triticum vulgare*, *Silybum marianum*, glycine soy, *Equisetum arvense*, *Alchemilla vulgaris*, *Medicago sativa*, *Raphanus sativus*] and Polyplant® Firming [INCI: Coneflower, *Centella Asiatica*, *Fucus*, Fenugreek] marketed by Provital, Lanablue® [INCI: sorbitol, algae extract] marketed by Atrium Innovations, Pepha®-Nutrix [INCI: natural nutrition factor]
 15 marketed by Pentapharm, vegetable extracts which contain isoflavones, Biopeptide EL™ [INCI: palmitoyl oligopeptide], Biopeptide CL™ [INCI: palmitoyl oligopeptide], Vexel® [INCI: water, propylene glycol, lecithin, caffeine, palmitoyl carnitine], Matrixyl® [INCI: palmitoyl pentapeptide-3], Matrixyl® 3000 [INCI: palmitoyl tetrapeptide-3, palmitoyl oligopeptide] and Bio-Bustyl™ [INCI: glyceryl
 20 polymethacrylate, Rahnella soy protein ferment, water, propylene glycol, glycerin, PEG-8, palmitoyl oligopeptide] marketed by Sederma, Dermosaccharides® HC [INCI: glycerin, water, glycosaminoglycans, glycogen], Aglycal® [INCI: mannitol, cyclodextrin, glycogen, *Arctostaphylos uva ursi* leaf extract], Cytokinol® LS [INCI: hydrolyzed casein, hydrolyzed yeast protein, lysine HCl] and Firmiderm® LS 9120
 25 [INCI: *Terminalia catappa* leaf extract, *Sambucus Nigra* Flower extract, PVP, tannic acid] marketed by Laboratoires Serobiologiques/Cognis, Liftline® [INCI: hydrolyzed wheat protein], Raffermin® [INCI: hydrolyzed soy flour] and Ridulisse C® [hydrolyzed soy protein] marketed by Silab, Serilesine® [INCI: hexapeptide-10], Decorinyl™ [INCI: tripeptide-10 citrulline], Trylagen® [INCI: *Pseudoalteromonas*
 30 ferment extract, hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide-10 citrulline, tripeptide-1], marketed by Lipotec, Ursolisome® [INCI: lecithin, ursolic acid, atelocollagen, xanthan gum, sodium chondroitin sulfate] and Collalift® [INCI:

hydrolyzed malt extract] marketed by Coletica/Engelhard, Syn[®]-Coll [INCI: palmitoyl tripeptide-5] marketed by Pentapharm, Hydriame[®] [INCI: water, glycosaminoglycans, sclerotium gum] marketed by Atrium Innovations, IP2000 [INCI: dextran, trifluoroacetyl tripeptide-2] marketed by Institut Européen de
 5 Biologie Cellulaire, and mixtures thereof.

Anti-glycation agents

[0140] Exemplary anti-glycation agents include *Vaccinium angustifolium* extracts, ergothioneine and derivatives thereof, lysine, Aldenine[®] [INCI: hydrolyzed wheat protein, hydrolyzed soy protein, tripeptide-1], Vilastene[™] [INCI: lysine HCl, lecithin, tripeptide-10 citrulline], dGlyage[™] [INCI: lysine HCl, lecithin, tripeptide-9 citrulline] and Eyeseryl[®] [INCI: acetyl tetrapeptide-5] marketed by Lipotec, hydroxystilbenes and derivatives thereof, resveratrol, 3,3',5,5'-tetrahydroxystilbene, and mixtures thereof.

5 α -reductase inhibiting agents

15 [0141] Exemplary 5 α -reductase inhibiting agents include extracts of *Cinnamomum verum*, *Laminaria saccharina*, *Spiraea ulmaria*, Nettle Root, *Pygeum africanum*, *Avena Sativa*, *Serenoa repens*, extracts of the plants *Arnica montana*, *Cinchona succirubra*, *Eugenia caryophyllata*, *Humulus lupulus*, *Hypericum perforatum*, *Mentha piperita*, *Rosmarinus officinalis*, *Salvia officinalis*, and *Thymus vulgaris*, extract of plants of the genus *Silybum*, extracts of plants which contain
 20 sapogenins and in particular extract of plants of the genus *Dioscorea*, phytosterols, retinoids and in particular retinol, sulfur and derivatives thereof, zinc salts and in particular zinc lactate, zinc gluconate, zinc pidolate, zinc carboxylate, zinc salicylate and zinc cysteate, selenium chloride, vitamin B6, pyridoxine, capryloyl
 25 glycine, sarcosine, finasteride, dutasteride, izonsteride, turosteride and their salts, and mixtures thereof.

Lysyl- and/or prolyl-hydroxylase-inhibiting agents

[0142] Exemplary lysyl- and/or prolyl-hydroxylase-inhibiting agents include 2,4-diaminopyrimidine 3-oxide, 2,4-diamino-6-piperidinopyrimidine 3-oxide, and
 30 mixtures thereof.

Defensin synthesis-stimulating agents

[0143] Exemplary defensin synthesis-stimulating agents include extracts of or hydrolyzed *Aloe Vera*, *Roast amaranth*, *Rehmanniae radix*, arnica, gardenia, carrot, orange, peach, pineapple, mint, gentian, hibiscus flower, walnut tree leaf, calabaza, peony, quinoa, boldo, rough bindweed, sunflower, elderberry, seaweed, hydrolyzed corn, hydrolyzed soy, hydrolyzed rice, valine and its isomers and derivatives, calcium and its salts, α -MSH and fragments contained in the amino acid sequence of α -MSH, vitamin A and its derivatives and precursors, vitamin D3 and its derivatives, jasmonic acid, fumaric acid, malic acid, citric acid, ascorbic acid, lactic acid, acetic acid, adipic acid, tartaric acid, cinnamic acid, glutamic acid, succinic acid, inulin, alkyl glucosides, poly-D-glutamic acid, glycine, L-methionine, L-alanine, L-citrulline, lactoprotein, casein, lactoperoxidase, lysozyme, polyphenol, alkyl glucosides, *Lactobacillus* extract, fusobacteria extracts, non-photosynthetic and non-fruiting filamentous bacteria, Bodyfensine™ [INCI: acetyl dipeptide-3 aminohexanoate] marketed by Lipotec, and mixtures thereof.

Antiseptic Agents and Disinfectants

[0144] Exemplary antiseptic agents and disinfectants include those serving as bactericidal, bacteriostatic, antimicrobial, germicidal, fungicidal, fungistatic and/or germ inhibiting agents.

[0145] Examples of such agents include, macrolides, pyranosides, calcium channel blockers, for example cinnarizine and diltiazem; hormones, for example estril and analogues thereof, thyroxine and/or its salts, caprylyl glycol, imidazolidinyl urea, sodium 4-oxybenzoate methyl, methyl 4-hydroxybenzoate [INCI: methylparaben], ethyl 4-oxybenzoate, ethyl 4-hydroxybenzoate [INCI: ethylparaben], propyl 4-oxybenzoate, isopropyl 4-oxybenzoate, propyl 4-hydroxybenzoate [INCI: propylparaben], butyl 4-oxybenzoate, butyl 4-hydroxybenzoate [INCI: butylparaben], isobutyl 4-hydroxybenzoate [INCI: isobutylparaben], 1,3-bis(hydroxymethyl)-5,5-dimethylimidazolidine-2,4-dione [INCI: DMDM hydantoin], benzyl 4-oxybenzoate, benzyl 4-hydroxybenzoate [INCI: benzylparaben], benzyl alcohol, dehydroacetic acid, benzoic acid, sodium benzoate, potassium sorbate, dehydroacetic acid, sodium dehydroacetate sorbic acid, salicylic acid, formic acid, propionic acid, 2-bromo-2-nitropropane-1,3-diol,

3-*p*-chlorophenoxy-1,2-propanediol [INCI: chlorphenesin], dichlorobenzyl alcohol, iodopropynyl butylcarbamate, benzalkonium chloride, odor-absorbing fungicides such as zinc ricinoleate, cyclodextrins, benzethonium chloride, chlorhexidine, ethanol, propanol, 1,3-butanediol, 1,2-propylene glycol, undecylenic acid, 5 dehydroacetic acid, *N*-methylmorpholine acetonitrile (MMA), isopropanol, methanol, 1,2-hexanediol, 1,2-octanediol, pentylene glycol, glycerin laurate, glycerin caprylate, glyceryl caprate, benzoyl peroxide, chlorhexidine gluconate, triclosan and derivatives thereof, phenoxyethanol, terpinen-4-ol, α -terpineol, resorcinol, stiemycin, erythromycin, neomycin, clindamycin and its esters, tetracyclines, 10 metronidazole, azelaic acid, tolnaftate, nystatin, clotrimazole, ketoconazole, derivatives of zinc such as zinc pyrithionate or trithionate, zinc oxide and zinc undecylenate, piroctone olamine, isothiazolinones, selenium sulfur, benzyl hemiformal, boric acid, sodium borate, 6,6-dibromo-4,4-dichloro-2,2'-methylene-diphenol [INCI: bromochlorophene], 5-bromo-5-nitro-1,3-dioxane, 15 tosylchloramide sodium [INCI: chloramine T], chloroacetamide, *p*-chloro-*m*-cresol, 2-benzyl-4-chlorophenol [INCI: chlorophene], dimethyl oxazolidine, dodecyl dimethyl-2-phenoxyethyl ammonium bromide [INCI: domiphen bromide], 7-ethyl bicyclo-oxazolidine, hexetidine, glutaraldehyde, *N*-(4-chlorophenyl)-*N*-[4-chloro-3-(trifluoromethyl)phenyl]-urea [INCI: cloflucarban], 2-hydroxy-4-isopropyl-2,4,6- 20 cycloheptatriene-1-one [INCI: Hinokitiol], isopropylmethylphenol, mercury salts, aluminum salts, nisin, phenoxyisopropanol, *o*-phenylphenol, 3-heptyl-2-[(3-heptyl-4-methyl-3*H*-thiazole-2-ylidene)methyl]-4-methylthiazole iodide [INCI: Quaternium-73], silver chloride, sodium iodide, thymol, undecylenic acid, diethylenetriaminepentaacetic acid, ethylenediaminetetraacetic acid and 25 ethylenediaminetetraacetates, lactoperoxidase, glucose oxidase, lactoferrin, alkylaryl sulfonates, halogenated phenols, phenol mercury acetate and/or mixtures thereof, benzamidines, isothiazolines, derivatives of phthalimide, derivatives of pyridine, guanidines, quinolines, 1,2-dibromo-2,4-dicyanobutane, iodine-2-propylbutyl carbamate, iodine, tamed iodines, peroxo compounds, 4-chloro-3,5- 30 dimethylphenol, 2,2'-methylene-bis(6-bromo-4-chlorophenol), 3-methyl-4-(1-methylethyl)phenol, 3-(4-chlorophenoxy)-1,2-propanediol, 3,4,4'-trichlorocarbanilide (TTC), beta-lactams, thiamine essence, eugenol, farnesol, glycerol monolaurate, diglycerin monocaprylate, *N*-alkyl salicylic acid amides such

as *n*-octyl salicylic acid amide or *n*-decyl salicylic acid amide, derivatives of halogenated xylene and cresol, such as *p*-chloro-meta-cresol or *p*-chloro-meta-xylene, extracts of *Allium sativum*, *Calendula officinalis*, *Chamomilla recutita*, *Echinacea purpurea*, *Hyssopus officinalis*, *Melaleuca alternifolia* or tea tree oil, 5 carnation essence, menthol and mint essence, light sensitive dye No. 101, light sensitive dye No. 201 and light sensitive dye No. 401, and mixtures thereof.

NO-synthase-inhibiting agents

[0146] Exemplary NO-synthase-inhibiting agents include extracts of the plants *Vitis vinifera*, *Olea europaea*, *Ginkgo biloba*, and mixtures thereof.

10 Desquamating agents and keratolytic agents

[0147] Exemplary desquamating agents and/or keratolytic agents and/or exfoliating agents include hydroxy acids and derivatives thereof, β -hydroxyacids, in particular salicylic acid and derivatives thereof, and gentisic acid; α -hydroxyacids and its salts, such as glycolic acid, ammonium glycolate, lactic acid, 2- 15 hydroxyoctanoic acid, α -hydroxycaprylic acid, mandelic acid, citric acid, malic acid and tartaric acid; α - and β -hydroxybutyric acids; polyhydroxy acids such as gluconic acid, glucuronic acid and saccharic acid; keto acids such as pyruvic acid, and glyoxylic acid; pyrrolidinecarboxylic acid; cysteic acid and derivatives thereof; aldobionic acids; azelaic acid and derivatives thereof such as azeloyl diglycinate; 20 ascorbic acid and derivatives thereof such as 6-*O*-palmitoylascorbic acid, ascorbyl glucoside, dipalmitoyl ascorbic acid, magnesium salt of ascorbic acid-2-phosphate (MAP), sodium salt of ascorbic acid-2-phosphate (NAP), ascorbyl tetraisopalmitate (VCIP); nicotinic acid, its esters and nicotinamide (also called vitamin B3 or vitamin PP); nordihydroguaiaretic acid; urea; oligofucoses; cinnamic acid; derivatives of 25 jasmonic acid; hydroxy stilbenes such as resveratrol; *Saccharum officinarum* extract; enzymes involved in desquamation or degradation of the corneodesmosomes, such as glycosidases, stratum corneum chymotryptic enzyme (SCCE) and other proteases such as trypsin, chymotrypsin, subtilisin, papain and bromelain; chelating agents such as ethylenediaminetetraacetic acid (EDTA) and 30 salts thereof, aminosulfonic compounds such as 4-(2-hydroxyethyl)piperazine-1-ethanesulfonic acid (HEPES) and sodium methylglycine diacetate (TRILON® M

marketed by BASF); derivatives of 2-oxothiazolidine-4-carboxylic acid (procysteine); derivatives of sugars such as O-octanoyl-6-D-maltose and N-acetylglucosamine; chestnut extract (*Castanea sativa*) such as that marketed by SILAB under the name Recoverine® [INCI: water, *Castanea sativa* seed extract];
 5 opuntia extract (*Opuntia ficus-indica*) such as that marketed by SILAB as Exfolactive® [INCI: hydrolyzed *Opuntia ficus Indica* flower extract]; Phytosphingosine SLC® [INCI: salicyloyl phytosphingosine] marketed by Degussa/Evonik, Peel-Moist™ [INCI: glycerin, papain, calcium pantothenate, xanthan gum, caprylyl glycol, urea, magnesium lactate, ethylhexylglycerin,
 10 potassium lactate, serine, alanine, proline, magnesium chloride, sodium citrate]; extract or combination of extracts of *Sophora japonica*, papaya, pineapple, pumpkin or sweet potato, and mixtures thereof.

Melanin Stimulating, Propigmenting, Self-Tanning and/or Melanocyte Proliferation Stimulating Agents

15 [0148] Example agents which stimulate the synthesis of melanin, the propigmenting agent, the self-tanning agent and/or the melanocyte proliferation stimulating agent include extracts of *Citrus Aurantium Dulcis Fruit*, *Coleus forskohlii*, *Coleus esquirolii*, *Coleus scutellarioides*, *Coleus xanthanthus*, *Ballota nigra*, *Ballota lanata*, *Ballota suaveolens*, *Marrubium cylleneum*, *Cistus creticus*,
 20 *Amphiachyris amoena*, *Aster oharai*, *Otostegia fruticosa*, *Plectranthus barbatus*, *Halimium viscosum* and *Larix laricina*, dihydroxyacetone and derivatives thereof, sugars, for example erythrulose, melanin and derivatives thereof including melanin polymers and derivatives of melanin with a low molecular weight which are soluble in water, forskolin and derivatives thereof including deacetylforskolin and
 25 isoforskolin, tyrosine and derivatives thereof including acetyl tyrosine, oleoyl tyrosine, 3-amino tyrosine and 3-nitrotyrosine, copper salts such as CuCl₂, carotenoids, canthaxanthins, polymers of dihydroxyindole carboxylic acid, 3,4-dihydroxybenzoic acid, 3-amino-4-hydroxybenzoic acid, aloin, emodin, alizarin, dihydroxyphenylalanine, 4,5-dihydroxynaphthalene-2-sulfonic acid, 3-
 30 dimethylaminophenol and *p*-aminobenzoic acid, Melatime™ [INCI: acetyl tripeptide-40] marketed by Lipotec, Heliostatine ISR™ [INCI: water, glycerin, *Pisum sativum* extract] marketed by Vincience/ISP, Vegetan® [INCI: dihydroxyacetone] or

Vegetan® Premium [INCI: dihydroxyacetone, melanin] marketed by Soliance, MelanoBronze™ [INCI: *Vitex agnus-castus* extract, acetyl tyrosine] marketed by Mibelle Biochemistry, Melitane® [INCI: acetyl hexapeptide-1] marketed by Institut Européen de Biologie Cellulaire/Unipex Innovations, Actibronze® [INCI: hydrolyzed wheat protein, acetyl tyrosine, copper gluconate] and Instabronze® [INCI: dihydroxyacetone, tyrosine] marketed by Alban Muller, Thalitan™ [INCI: hydrolyzed algin, magnesium sulfate, manganese sulfate] marketed by CODIF, Tyrosilane® [INCI: methylsilanol acetyl tyrosine] marketed by Exsymol, Tyr-Excel™ [INCI: oleoyl tyrosine, *Luffa Cylindrica* seed oil, oleic acid] or Tyr-OI™ [INCI: oleoyl tyrosine, butylene glycol, oleic acid] marketed by Sederma/Croda, Bronzing S.F. [proposed INCI: butyryl pentapeptide] marketed by Infinitec Activos or Biotanning® [INCI: *hydrolyzed Citrus aurantium dulcis* fruit extract] marketed by Silab, and mixtures thereof.

Lipolytic agents, agents stimulating lipolysis, venotonic agents and anti-cellulite agents

[0149] Exemplary lipolytic agents, agents stimulating lipolysis, venotonic agents and/or anti-cellulite agents include extracts of *Bupleurum chinensis*, *Cecropia obtusifolia*, *Celosia cristata*, *Centella asiatica*, *Chenopodium quinoa*, *Chrysanthellum indicum*, *Citrus aurantium amara*, *Coffea arabica*, *Coleus forskohlii*, *Commiphora myrrha*, *Crithmum maritimum*, *Eugenia caryophyllus*, *Ginkgo biloba*, *Hedera helix* (ivy extract), *Hibiscus sabdariffa*, *Ilex paraguariensis*, *Laminaria digitata*, *Nelumbium speciosum*, *Paullinia cupana*, *Peumus boldus*, *Phyllacantha fibrosa*, *Prunella vulgaris*, *Prunus amygdalus dulcis*, *Ruscus aculeatus* (Butcher's broom extract), *Sambucus nigra*, *Spirulina platensis algae*, *Uncaria tomentosa* and *Verbena officinalis*, dihydromyricetin, coenzyme A, lipase, glaucine, visnadine, Regu®-Shape [INCI: isomerized linoleic acid, lecithin, glycerin, polysorbate 80] marketed by Pentapharm/DSM, UCPeptide™ V [INCI: pentapeptide] and AT Peptide™ IS [INCI: tripeptide-3] marketed by Vincience/ISP, Liporeductyl® [INCI: caffeine, Butcher's broom (*Ruscus aculeatus*) root extract, TEA-hydroiodide, carnitine, ivy (*Hedera helix*) extract, escin, tripeptide-1] marketed by Lipotec, Adiposlim™ [INCI: sorbitan laurate, lauroyl proline] marketed by SEPPIC, caffeine, carnitine, escin, triethanolamine iodide, and mixtures thereof.

Heat Shock Protein Synthesis Stimulating Agents

[0150] Exemplary heat shock protein synthesis stimulating agents include extracts of *Opuntia ficus indica*, *Salix alba*, *Lupinus spp.*, *Secale cereale*, extracts of red algae from the genus *Porphyra*, extracts of crustaceans from the genus *Artemia*, jojoba seed oil, grape seed extracts, green tea extracts, geranylgeranylacetone, celastrol, zinc and its salts, 2-cyclopenten-1-one, proteasome inhibitors, for example bortezomib; prostaglandins and derivatives thereof, hydroxylamine and derivatives thereof, for example bimoclomol; chalcone and derivatives thereof, hyperosmotic agents, for example sorbitol and derivatives thereof, mannitol and derivatives thereof or glycerol and derivatives thereof, isosorbide (dianhydro-D-glucitol) urea or salicylic acid and derivatives thereof among others, Thermostressine™ [INCI: acetyl tetrapeptide-22], and mixtures thereof.

Agents Inhibiting Sweat-Degrading Enzymes

[0151] Exemplary agents for inhibiting sweat-degrading enzymes include trialkyl citrates such as trimethyl citrate, tripropyl citrate, triisopropyl citrate, tributyl citrate or triethyl citrate; lanosterine sulfate and lanosterine phosphate, cholesterol, campesterol, stigmasterol and sitosterol; dicarboxylic acids and their esters, such as glutaric acid, monoethyl glutarate, diethyl glutarate, adipic acid, monoethyl adipate, diethyl adipate; malonic acid and diethyl malonate, hydroxycarboxylic acids and their esters such as malic acid, tartaric acid and diethyl tartrate, zinc glycinate, and mixtures thereof.

Agents Stimulating or Regulating Keratinocyte Differentiation

[0152] Exemplary agents for stimulating or regulating keratinocyte differentiation include minerals such as calcium, retinoids such as retinol and tretinoin, analogues of vitamin D3 such as calcitriol, calcipotriol and tacalcitol, lupine (*Lupinus albus*) extract such as that marketed by SILAB under the name Structurin® [INCI: hydrolyzed lupine protein], β -sitosterol sulfate, such as that marketed by Vincience/ISP under the name Phytocohesine PSP® [INCI: sodium beta-sitosterol sulfate], maize (*Zea Mays*) extract such as that marketed by Solabia under the

name Phytovityl C[®] [INCI: water, Zea Mays extract], *Helix aspersa* Müller glycoconjugates, and mixtures thereof.

Exopolysaccharides

[0153] Exemplary exopolysaccharides, such as those of bacterial origin, include
5 those secreted by a strain of the *Halomonas anticariensis* species, which reduce lipid accumulation, as described in WO 2015/063240, and an exopolysaccharide which inhibits neuronal exocytosis and stimulates the fibroblast proliferation which is excreted by the strain of the *Vibrio* sp. species with deposit number CNCM 1–4239 according to the Budapest Treaty on September 4, 2009, in the "Collection
10 Nationale de Culture de Microorganismes" [National Microorganism Culture Collection] (CNCM), Pasteur Institute, 28 rue du Docteur Roux, 75724 Paris, France, as described in WO 2014147255 and US 14/778,874, filed September 21, 2015.

[0154] Exemplary cell extracts and extracts produced by microorganisms, or
15 commercial mixtures which contain them include hydrosoluble cell extracts and hydrosoluble extracts produced by microorganisms, for example Antarcticine[®] [INCI: *Pseudoalteromonas* ferment extract] and Trylagen[®] [INCI: *Pseudoalteromonas* ferment extract, hydrolyzed wheat protein, hydrolyzed soy protein, Tripeptide–10 citrulline, Tripeptide–1] marketed by Lipotec, yeast extract,
20 extract of *Saccharomyces cerevisiae* and the product of milk fermentation with *Lactobacillus Bulgaricus*, among others.

Excipients

[0155] Excipients which may be present include emulsifiers, organic solvents, surfactants, liquid propellants, binders and thickeners, fillers, lubricants, glidants,
25 pigments, dyes, perfumes, flavoring agents, preservatives, and combinations thereof.

[0156] Components serving as lubricants, solvents, propellants, binders and thickeners and emulsifiers may include one or more of liquid hydrocarbons, waxes, natural fats and fatty oils, alcohols, ethers, esters, silicone oils, monosaccharides,
30 polymers, and the like.

[0157] Exemplary liquid hydrocarbons include α -olefins, C₁₀–C₄₀ alkanes, C₁₀–C₄₀ alkenes, and mixtures thereof, such as squalene, ceresin, mineral oils, and petroleum jelly.

[0158] Exemplary waxes include microcrystalline wax, natural waxes such as
5 jojoba oil, carnauba wax, candelilla wax, rice bran wax, shellac, lanolin, mink sebaceous wax, spermaceti wax, sugarcane wax, sperm whale oil, beeswax and montan wax.

[0159] Exemplary natural fats and fatty oils include avocado oil, almond oil, olive oil, extra virgin olive oil, sesame seed oil, rice bran oil, rice oil, rice germ oil, corn
10 oil, safflower oil, soybean oil, maize oil, rape seed oil, persic oil, palm kernel oil, palm oil, castor oil, sunflower oil, high oleic sunflower oil, grape seed oil, cottonseed oil, coconut oil, hydrogenated coconut oil, beef tallow, hydrogenated oil, horse oil, mink oil, yolk oil, yolk fat oil, rose hip oil, kukui nut oil, evening primrose oil, wheat germ oil, peanut oil, *Camellia japonica* oil, *Camellia kissi* oil, cacao
15 butter, Japan wax, beef bone tallow, nest's-foot oil, swine tallow, equine tallow, ovine tallow, shea butter, macadamia nut oil and meadow foam seed oil.

[0160] Exemplary fatty acids include lauric acid, myristic acid, palmitic acid, stearic acid, behenic acid, oleic acid, linoleic acid, linolenic acid, γ -linolenic acid, isostearic acid, 12-hydroxystearic acid, undecenoic acid and coconut oil fatty acid.

[0161] Exemplary lower alcohols include ethanol, 1-propanol, 2-propanol, 1-butanol, 2-butanol and benzyl alcohol. Exemplary higher alcohols include
20 isostearyl alcohol, 2-octyldodecan-1-ol, 2-hexyldecan-1-ol, cholesterol, phytosterols, lauryl alcohol, myristyl alcohol, cetyl alcohol, stearyl alcohol, oleyl alcohol, behenyl alcohol and cetostearyl alcohol. Exemplary polyhydric alcohols
25 include ethylene glycol, diethylene glycol, triethylene glycol, polyethylene glycol, propylene glycol, dipropylene glycol, polypropylene glycol, pentanediol, glycerin, diglycerin, polyglycerin, isoprene glycol, 1,3-butylene glycol, 3-methyl-1,3-butanediol, 1,3-butanediol, 1,2-pentanediol and 1,2-hexanediol.

[0162] Exemplary alkyl glyceryl ethers include stearyl monoglyceride, 3-hexadecoxypropane-1,2-diol, 3-[(Z)-octadec-9-enoxy]propane-1,2-diol and
30 isostearyl glyceryl ether.

[0163] Exemplary esters include isopropyl myristate, butyl myristate, isopropyl palmitate, ethyl stearate, butyl stearate, ethyl oleate, ethyl linoleate, isopropyl

linoleate, cetyl caprylate, hexyl laurate, isooctyl myristate, decyl myristate, myristyl myristate, cetyl myristate, octadecyl myristate, cetyl palmitate, stearyl stearate, decyl oleate, oleyl oleate, cetyl ricinoleate, isostearyl laurate, isotridecyl myristate, isocetyl myristate, isostearyl myristate, 2-octyldodecyl myristate, 2-ethylhexyl
 5 palmitate, isocetyl palmitate, isostearyl palmitate, 2-ethylhexyl stearate, isocetyl stearate, isodecyl oleate, octyldodecyl oleate, octyldodecyl ricinoleate, ethyl isostearate, isopropyl isostearate, cetyl 2-ethylhexanoate, cetostearyl 2-ethylhexanoate, stearyl 2-ethylhexanoate, hexyl isostearate, ethylene glycol dioctanoate, ethylene glycol dioleate, propylene glycol dicaprylate, propylene glycol
 10 dicaprylate/dicaprate, lauryl lactate, myristyl lactate, cetyl lactate, trioctyl citrate, diisostearyl malate, 2-ethylhexyl hydroxystearate, diisopropyl adipate, diisopropyl sebacate, dioctyl sebacate, cholesteryl stearate, cholesteryl isostearate, cholesteryl hydroxystearate, cholesteryl oleate, dihydrocholesteryl oleate, phytosteryl isostearate, phytosteryl oleate, isocetyl 12-stearoyl hydroxystearate, stearyl 12-
 15 stearoyl hydroxystearate, isostearyl 12-stearoyl hydroxystearate, octyl isononanoate.

[0164] Exemplary silicone oils include polysiloxanes, polyether modified silicones, alcohol modified silicones, alkyl modified silicones, and amino modified silicones.

20 **[0165]** Exemplary saccharides include mannitol, sorbitol, xylitol, maltitol, erythritol, pentaerythritol, glucose, sucrose, fructose, lactose, maltose, xylose and trehalose.

[0166] Exemplary polymers include sodium alginate, carrageenan, agar, guar gums, tamarind gum, dextrin, starch, locust bean gum, gum arabic, pectin, quince,
 25 chitosan, starch, curdlan, xanthan gum, dextran, pullulan, microcrystalline cellulose, methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, hydroxypropyl methylcellulose, carboxymethyl cellulose, carboxy starch, cationized cellulose, starch phosphate ester, albumin, casein, gelatin, sodium polyacrylate, polyacrylamides, carboxyvinyl polymers, polyethylene imines,
 30 polyethylene glycol, polyvinyl alcohol, polyvinyl pyrrolidone, polyvinyl ether, polyacrylamides, acrylic acid copolymers, methacrylic acid copolymers, maleic acid copolymers, vinylpyridine copolymers, ethylene/acrylic acid copolymers, vinyl pyrrolidone based polymers, vinyl alcohol/vinyl pyrrolidone copolymers, N-

substituted acrylamide based polymers, amino-modified silicones, dimethylacrylic acid based polymers, acrylic acid based anionic polymers, methacrylic acid based anionic polymers, modified silicone, acrylate/methacrylate C₁₀–C₃₀ alkyl copolymers, and polyoxyethylene/polyoxypropylene copolymers.

- 5 **[0167]** Exemplary anionic surfactants include potassium coconut oil fatty acid, sodium coconut oil fatty acid, triethanolamine coconut oil fatty acid, potassium laurate, sodium laurate, triethanolamine laurate, potassium myristate, sodium myristate, isopropanolamine myristate, potassium palmitate, sodium palmitate, isopropanolamine palmitate, potassium stearate, sodium stearate, triethanolamine
- 10 stearate, potassium oleate, sodium oleate, castor oil fatty acid sodium, zinc undecylate, zinc laurate, zinc myristate, magnesium myristate, zinc palmitate, zinc stearate, calcium stearate, magnesium stearate, aluminum stearate, calcium myristate, magnesium myristate, aluminum dimyristate, aluminum isostearate, polyoxyethylene lauryl ether acetate, sodium polyoxyethylene lauryl ether acetate,
- 15 polyoxyethylene tridecyl ether acetate, sodium polyoxyethylene tridecyl ether acetate, sodium stearyl lactate, sodium isostearyl lactate, sodium lauroyl sarcosinate, coconut oil fatty acid sarcosinate, sodium coconut oil fatty acid sarcosinate, coconut oil fatty acid sarcosine triethanolamine, lauroyl sarcosine, potassium lauroyl sarcosinate, lauroyl sarcosine triethanolamine, oleoyl sarcosine,
- 20 sodium myristoyl sarcosinate, sodium stearyl glutamate, coconut oil fatty acid acyl glutamic acid, potassium coconut oil fatty acid acyl glutamate, sodium coconut oil fatty acid acyl glutamate, lauroyl glutamic acid, potassium lauroyl glutamate, sodium lauroyl glutamate, myristoyl glutamic acid, potassium myristoyl glutamate, sodium myristoyl glutamate, stearyl glutamic acid, potassium stearyl glutamate,
- 25 disodium stearyl glutamate, sodium hydrogenated beef tallow fatty acid acyl glutamate, sodium coconut oil fatty acid/hydrogenated beef tallow fatty acid acyl glutamate, lauroyl methyl alanine, sodium lauroyl methyl alanine, sodium myristoyl methyl alanine, sodium lauroyl methyl taurate, sodium oleoyl methyl taurate, sodium alkane sulfonate, sodium tetradecene sulfonate, sodium dioctyl
- 30 sulfosuccinate, disodium lauryl sulfosuccinate, sodium coconut oil fatty acid ethyl ester sulfonate, sodium lauryl sulfate, triethanolamine lauryl sulfate, sodium cetyl sulfate, triethanolamine alkyl sulfates, sodium alkyl sulfates, triethanolamine alkyl sulfates, alkyl ammonium sulfates, diethanolamine alkyl sulfates, triethanolamine

alkyl sulfates, triethanolamine alkyl sulfates, lauryl ammonium sulfate, potassium lauryl sulfate, magnesium lauryl sulfate, monoethanolamine lauryl sulfate, diethanolamine lauryl sulfate, sodium myristyl sulfate, sodium stearyl sulfate, sodium oleyl sulfate, triethanolamine oleyl sulfate, sodium polyoxyethylenes lauryl ether sulfates, triethanolamine polyoxyethylene lauryl ether sulfate, sodium polyoxyethylene alkyl ether sulfates, triethanolamine polyoxyethylene alkyl ether sulfates, sodium polyoxyethylene myristyl ether sulfates, sodium higher fatty acid alkanolamide sulfate esters, lauryl phosphate, sodium lauryl phosphate, potassium cetyl phosphate, diethanolamine cetyl phosphate, polyoxyethylene oleyl ether phosphate, polyoxyethylene lauryl ether phosphate, sodium polyoxyethylene lauryl ether phosphate, polyoxyethylene cetyl ether phosphate, sodium polyoxyethylene cetyl ether phosphate, polyoxyethylene stearyl ether phosphate, polyoxyethylene oleyl ether phosphate, sodium polyoxyethylene oleyl ether phosphate, polyoxyethylene alkylphenyl ether phosphates, sodium polyoxyethylene alkylphenyl ether phosphates, triethanolamine polyoxyethylene alkylphenyl ether phosphates, polyoxyethylene octyl ether phosphate, polyoxyethylene alkyl ether phosphate, triethanolamine polyoxyethylene lauryl ether phosphate, and diethanolamine polyoxyethylene oleyl ether phosphate.

[0168] Exemplary cationic surfactants include alkyl amines, alkyl imidazolines, ethoxylated amides, quaternary compounds, quaternized esters, and alkyl amine oxides. Examples include lauramine oxide, dicetyldimonium chloride, and cetrimonium chloride.

[0169] Exemplary amphoteric and zwitterionic surfactants include betaines, alkyl amidopropyl betaines, alkyl sulfobetaines, alkyl glycines, alkyl carboxyglycines, alkyl amphopropionates, alkyl amidopropyl hydroxysultaines, acyl taurates and acyl glutamates wherein the alkyl and acyl groups have from 8 to 18 carbon atoms. Examples include cocoamidopropyl betaine, sodium cocoamphoacetate, cocoamidopropyl hydroxysultaine, and sodium cocoamphopropionate.

[0170] Exemplary nonionic surfactants include aliphatic (C₆–C₁₈) primary or secondary linear or branched chain acids, alcohols or phenols, alkyl ethoxylates, alkyl phenol alkoxyates (especially ethoxylates and mixed ethoxy/propoxy), block alkylene oxide condensate of alkyl phenols, alkylene oxide condensates of alkanols, ethylene oxide/propylene oxide block copolymers, semi-polar nonionics

(e.g., amine oxides), as well as alkyl amine oxides. Other suitable nonionics include mono- or di- alkyl alkanolamides and alkyl polysaccharides, sorbitan fatty acid esters, polyoxyethylene sorbitan fatty acid esters, polyoxyethylene sorbitol esters, polyoxyethylene acids, and polyoxyethylene alcohols. Examples of nonionic surfactants include alkyl polyglucoside, cocamidopropyl and lauramine oxide, polysorbate 20, ethoxylated linear alcohols, cetearyl alcohol, lanolin alcohol, stearic acid, glyceryl stearate, polyoxyethylene lauryl ether, polyoxyethylene oleyl ether, PEG-100 stearate, sorbitan monooleate, sorbitan isostearate, and oleth-20, and mixtures thereof.

[0171] Exemplary powdered fillers include kaolin, silicic anhydride, magnesium aluminum silicate, sericite, talc, boron nitride, mica, montmorillonite, cellulose powder, wheat starch, silk powder, maize starch, and mixtures thereof.

[0172] Exemplary dyes and pigments include nitro dyes, azo dyes, nitroso dyes, xanthene dyes, quinoline dyes, anthraquinone dyes, indigo dyes, sepia powder, caramel, cochineal, carbon black, yellow iron oxide, black iron oxide, red iron oxide, titanium oxide, titanium dioxide, and mixtures thereof.

[0173] Exemplary pH adjusting agents include sodium hydroxide, potassium hydroxide, triethanolamine, and mixtures thereof.

[0174] Exemplary salts include sodium chloride, potassium chloride, magnesium chloride, sodium sulfate, and mixtures thereof.

[0175] Exemplary α -hydroxy acids include citric acid, glycolic acid, tartaric acid and lactic acid, and mixtures thereof.

[0176] Exemplary cosmetic and/or absorbent and/or body odor masking deodorant and/or antiperspirant agent, perfuming substance and/or perfumed oils include the complex zinc salt of ricinoleic acid, Styrax, derivatives of abiotic acid, sage essence, chamomile essence, carnation essence, lemon balm essence, mint essence, cinnamon leaf essence, lime flower essence, juniper berry essence, vetiver essence, olibanum essence, galbanum essence, labdanum essence, lavender essence, peppermint essence, bergamot orange, dihydromyrcenol, linal, lylal, citronellol, lemon essence, mandarin essence, orange essence, lavender essence, muscat, geranium bourbon essence, aniseed, cilantro, cumin, juniper, extracts of fleur-de-lis, lilac, roses, jasmine, bitter orange blossom; benzyl acetate, *p*-*tert*-butylcyclohexyl acetate, linalyl acetate, phenylethyl acetate,

ethylmethylphenyl glycinate, linalyl benzoate, benzyl formate, allyl cyclohexyl propionate, styrallyl propionate, benzyl salicylate, benzyl ethyl ether, linear alkanes with from 8 to 18 carbon atoms, citral, ricinoleic acid, citronellal, citronellyl oxyacetaldehyde, cyclamen aldehyde, hydroxycitronellal, bourgeonal, ionones, methyl cedryl ketone, anethole, eugenol, isoeugenol, geraniol, linalool, terpineol, phenylethyl alcohol, α -hexylcinnamaldehyde, geraniol, benzylacetone, cyclamen aldehyde, hydroxycitronellal, ambroxan, indole, hedione, sandelice, cyclovertal, β -damascone, allyl amyl glycolate, dihydromyrcenol, phenoxyethyl isobutyrate, cyclohexyl salicylate, phenylacetic acid, geranyl acetate, irotyl, floramate, active astringent products such as aluminum chloride, aluminum chlorohydrate, aluminum dichlorohydrate, aluminum sesquichlorohydrate, aluminum dihydroxyallantoinate, aluminum chlorotartrate, aluminum and zirconium trichlorohydrate, aluminum and zirconium tetrachlorohydrate, aluminum and zirconium pentachlorohydrate and/or mixtures thereof.

[0177] Exemplary essential oils include *Archangelica officinalis* (angelica) oil, *Canangium odoratum* (ylang ylang) oil, *Canarium luzonicum* (elemi) oil, orange oil, *Chamomilla recutita* (matricaria) oil, *Anthemis nobilis* oil, *Elettaria cardamomum* (cardamom) oil, *Acorus calamus* (calamus) oil, *Ferula galbaniflua* (galbanum) oil, *Cinnamomum camphora* (camphor) oil, *Daucus carota* (carrot) seed oil, *Salvia sclarea* (clary sage) oil, *Citrus paradisi* (grapefruit) oil, *Eugenia caryophyllus* (clove) oil, Cinnamon bark oil, *Coriandrum sativum* (coriander) oil, *Cupressus sempervirens* (cypress) oil, *Santalum album* (sandalwood) oil, *Juniperus virginiana* (cedar wood) oil, *Cymbopogon nardus* (citronella) oil, *Cinnamomum verum* (Cinnamon) leaf oil, *Jasmine officinale* (jasmine) absolute oil, *Juniperus communis* (juniper Berry) oil, *Zingiber officinale* (ginger) extract, *Mentha spicata* (spearmint) oil, *Salvia officinalis* (sage) oil, cedar oil, *Pelargonium graveolens* (geranium) oil, *Thymus vulgaris* (thyme) oil, *Melaleuca alternifolia* (tea tree) oil, *Myristica fragrans* (nutmeg) oil, *Melaleuca viridiflora* (niaouli) oil, *Citrus aurantium* (neroli) oil, pine oil, *Ocimum basilicum* (basil) oil, *Mentha arvensis* oil, *Pogostemon cablin* (patchouli) oil, *Cymbopogon martinii* (palmarosa) oil, *Foeniculum vulgare* (fennel) oil, *Citrus bigaradia* (petitgrain) oil, *Piper nigrum* (black pepper) oil, *Boswellia carteri* (frankincense) oil, *Chrysopogon zizanioides* (vetiver) oil, *Mentha piperita* (peppermint) oil, *Citrus bergamia* (bergamot) oil, benzoin oil, *Aniba rosaeodora*

(rosewood) oil, *Origanum majorana* (marjoram) oil, mandarin oil, *Commiphora myrrha* (myrrh) oil, *Melissa officinalis* (balm mint) oil, *Eucalyptus globulus* oil, *Citrus junos* oil, *Citrus aurantiifolia* (lime) oil, *Ravensara aromatica* (clove) oil, *Lavandula latifolia* (lavandin) oil, *Lavandula angustifolia* (lavender) oil, *Tilia vulgaris* (linden) oil, lemon oil, lemon grass oil, rose oil, *Aniba rosaeodora* (rosewood) oil, *Rosmarinus officinalis* (rosemary) oil and *Levisticum officinale* (lovage) oil, and mixtures thereof.

[0178] In one embodiment, the active agent includes at least one active agent which is selected from skin whitening or depigmentation agents, anti-acne agents, and mixtures thereof.

[0179] Other pharmaceutical active ingredients and/or adjuvants useful herein include antacids; agents against peptic ulcers (e.g., butylscopolamine bromide, pirenzepine hydrochloride, timentidine bromide) and gastroesophageal reflux disease; antispasmodics; analgesics; anticholinergic drugs; propulsive drugs; antiemetics; anti-nausea drugs; agents for biliary therapy; agents for hepatic therapy; lipotropics; laxatives; antidiarrhetics; intestinal adsorbents; antipropulsives; anti-inflammatory drugs; active ingredients against obesity; enzymes; hypoglycemic drugs; insulin and analogues; vitamins; proteins; minerals; anabolic steroids; antithrombotic agents; antifibrinolytics; hemostatic agents; antiarrhythmic agents; cardiac stimulants; cardiac glycosides; vasodilators; antiadrenergic agents; antihypertensive drugs; diuretics; potassium-saving agents; antihemorrhoidals; antivaricose therapy agents; capillary stabilizing agents; agents which act on the renin-angiotensin system; beta-blockers; selective calcium-channel blockers; non-selective calcium-channel blockers; ACE inhibitors; angiotensin II inhibitors; agents modifying lipids; antifungals; antipruritics; anesthetics; antipsoriatics; chemotherapy drugs; corticosteroids; products for gynecological use (e.g., oxytocics, contraceptives, androgen, estrogen, progestogen, ovulation stimulants, gonadotropins, antiandrogens); products for urological use; antispasmodics; drugs used in benign prostatic hypertrophy; hormones; hormone antagonists; antibiotics; tetracyclines; amphenicols; penicillin; sulfonamides; trimethoprim; macrolides; lincosamides; streptogramins; antibacterial aminoglycosides; antibacterial quinolones; antivirals; immune serum; immunoglobulins; antineoplastic agents; immunomodulatory agents; alkylation agents; antimetabolites; plant alkaloids and

other natural products; cytotoxic antibiotics; immunosuppressive agents; drugs for disorders of the musculoskeletal system; antirheumatics; agents which affect bone structure and mineralization; drugs which act on the nervous system; general anesthetics; local anesthetics; opioids; antimigraine agents; anticonvulsants; 5 dopaminergic agents; antipsychotics (e.g., chlorpromazine hydrochloride, levomepromazine hydrochloride, clocapramine hydrochloride); anxiolytics; hypnotics; sedatives; antidepressants (e.g., imipramine hydrochloride, trazodone hydrochloride, fluvoxamine maleate); psychostimulants; anti-dementia drugs (e.g., donepezil, rivastigmine, galanthamide hydrobromide, memantine hydrochloride); 10 antianxiety drugs (e.g., diazepam, alprazolam, tandospirone citrate); tranquilizers (hydroxyzine hydrochloride); brain function stimulant/activators (e.g., tiapride hydrochloride, protirelin tartrate); cerebral circulation improving drugs (isosorbide mononitrate or dinitrate, pentoxifylline, fasudil hydrochloride); Parkinson's disease therapeutic agents (hydrochloric acid benserazide, amantadine hydrochloride, 15 talipexole hydrochloride); chemical-transmitter release-inhibition drugs (emedastine fumarate, suplastat tosilate, epinastine hydrochloride); cardiac disease therapeutic agents (e.g., aminophylline, diltiazem hydrochloride, nicorandil, propranolol hydrochloride, isoprenaline hydrochloride, disopyramide phosphate, procainamide hydrochloride); antihypertensive drugs (e.g., captopril, enalapril maleate, 20 amosulalol hydrochloride, prazosin hydrochloride, urapidil, clonidine hydrochloride); vasodilators (e.g., tolazoline hydrochloride); vasoconstrictors (e.g., amezinium metilsulfate, etilefrine hydrochloride, phenylephrine hydrochloride, midodrine hydrochloride); antihyperlipidemic drugs (pravastatin sodium, fluvastatin sodium, cerivastatin sodium); parasympathomimetics; drugs used in addictive disorders; anti- 25 vertigo agents; antiparasitic agents; insecticides; insect repellants; nasal decongestants; antitussives and expectorants (dextromethorphan hydrobromide, fominoben hydrochloride, acetylcysteine); asthma preparations (clenbuterol hydrochloride, fenoterol hydrobromide, procaterol hydrochloride); mucolytic agents; cough suppressants; ophthalmic active ingredients; otological active ingredients; 30 antiglaucoma drugs; miotics; mydriatics; cycloplegics; anti-dandruff agents; muscle contraction inhibitory agents; H2 blockers (e.g., ranitidine hydrochloride, roxatidine-hydrochloride acetate); proton pump inhibitors (e.g., omeprazole, lansoprazole, rabeprazole), antiemetic (e.g., granisetron hydrochloride, azasetron hydrochloride,

ondansetron hydrochloride, ramosetron hydrochloride), anti-rheumatism agents (e.g., bucillamine, penicillamine); urological-diseases drugs (e.g., oxybutynin hydrochloride, tamsulosin hydrochloride, propiverine hydrochloride); (beta)-blockers (e.g., bisoprolol fumarate, betaxolol hydrochloride); and mixtures thereof.

5 **[0180]** The nature of these active ingredients excipients can be synthetic or natural, such as vegetable extracts, or come from a biotechnological process or from a combination of a synthetic process and a biotechnological process. Additional examples can be found in the Personal Care Product Council (PCPC) International Cosmetic Ingredient Dictionary & Handbook, 15th Edition (2014). A
10 biotechnological process is understood to be any process which produces the active ingredient, or part of it, in an organism, or in a part of it.

[0181] In some embodiments, one or more of the active agents and/or excipients may be present in the exemplary film or on a surface thereof in the form of liposomes, mixed liposomes, oleosomes, niosomes, millicapsules, microcapsules,
15 nanocapsules, nanostructured lipid carriers, cyclodextrins, vesicles, micelles, mixed micelles of surfactants, surfactant-phospholipid mixed micelles, millispheres, microspheres, nanospheres, lipospheres, microemulsions, nanoemulsions, miniparticles, milliparticles, microparticles, nanoparticles and solid lipid nanoparticles.

20 Processes to Make the TPU and Face Mask

1. "One-Shot" Process

[0182] The reactants (the polyols, the diisocyanate, and the chain extender), and optionally a catalyst, may be reacted together to form the TPU. Any known processes to react these reactants may be used to make the TPU. In one
25 embodiment, the process is a so-called "one-shot" process where all the reactants are added to an extruder reactor and reacted. The equivalent weight amount of the diisocyanate to the total equivalent weight amount of the hydroxyl containing components, that is, the polyols and the chain extender, can be from 0.95 to 1.10, or from 0.96 to 1.02, and even from 0.97 to 1.005. Reaction temperatures utilizing a
30 urethane catalyst can be from 175 to 245 °C, and in another embodiment from 180 to 220 °C. The resulting composition may be pelletized, granulated, or directly formed into the film.

2. Pre-Polymer Process

[0183] The TPU can also be prepared utilizing a pre-polymer process. In the pre-polymer route, the polyols are first reacted with generally an equivalent excess of one or more diisocyanates to form a pre-polymer solution having free or unreacted diisocyanate therein. The reaction is generally carried out at temperatures of from 80 to 220 °C, or from 150 to 200 °C in the presence of a suitable urethane catalyst. Subsequently, a chain extender, as noted above, is added in an equivalent amount generally equal to the isocyanate end groups as well as to any free or unreacted diisocyanate compounds. The overall equivalent ratio of the total diisocyanate to the total equivalent of the polyol intermediate and the chain extender is thus from 0.95 to 1.10, or from 0.96 to 1.02 and even from 0.97 to 1.05. The chain extension reaction temperature is generally from 180 to 250 °C or from 200 to 240 °C. Typically, the pre-polymer route can be carried out in any conventional device including an extruder. In such embodiments, the polyol intermediates are reacted with an equivalent excess of a diisocyanate in a first portion of the extruder to form a pre-polymer solution and subsequently the chain extender is added at a downstream portion and reacted with the pre-polymer solution. Any conventional extruder can be utilized, including extruders equipped with barrier screws having a length to diameter ratio of at least 20 and in some embodiments at least 25.

[0184] In one embodiment, the ingredients are mixed on a single or twin screw extruder with multiple heat zones and multiple feed ports between its feed end and its die end. The ingredients may be added at one or more of the feed ports and the resulting TPU composition that exits the die end of the extruder may be pelletized, granulated, or used directly for forming into the film.

3. Continuous Process

[0185] The “pre-polymer” process and the “one shot” process can be performed in either a batch or continuous manner. That is, in some embodiments the TPU may be made by reacting the components together in a “one shot” polymerization process wherein all of the components, including reactants are added together simultaneously or substantially simultaneously to a heated extruder and reacted to form the TPU. In other embodiments the TPU may be made by first reacting the

polyisocyanate component with some portion of the polyols forming a pre-polymer, and then completing the reaction by reacting the pre-polymer with the remaining reactants, resulting in the TPU. After exiting the extruder, the composition may be pelletized, granulated, or directly formed into the film.

5 **[0186]** To form the film, the polyurethane polymer may be solvent cast or extruded onto a release layer.

[0187] Solvent casting may include combining the TPU with a casting liquid to form a casting solution. The casting liquid may be a mixture of water and a water-miscible organic solvent, such as one or more of a C₂-C₁₀ alcohol, tetrahydrofuran,
10 dimethylacetamide, dimethylformamide, and the like. A ratio of solvent to water in the casting liquid/solution may be from 20:1 to 1:10. As an example, a mixture of ethanol and water is used for casting. The casting solution may optionally include one or more of the active agents and/or excipients. The casting solution may be applied to a release layer, such as a sheet of high density polyethylene (HDPE),
15 Teflon™, or low density polyethylene (LDPE), to provide a cast film. The cast film may be dried to form the dry polymer film, e.g., in air or another atmosphere, at room temperature or slightly above.

[0188] The resulting dry film may be shaped to form the face mask, e.g., by cutting the film to the desired shape. The face mask may be hydrated, prior to use,
20 with an aqueous solution. The aqueous hydration solution may contain one or more of the active agents and/or excipients. The hydration may be performed before or after cutting the film to the desired shape.

[0189] In one embodiment, the active agent is present in the film prior to shaping and hydration. For example, the active agent is incorporated during solvent
25 casting of the film. The active agent-containing film may be hydrated before or after cutting the film in to the shape of the face mask.

[0190] The release layer is removed before or after applying the face mask to the skin of the user.

[0191] One advantage of the exemplary TPU film is that it can be cold
30 processed (e.g., solvent cast, e.g., at a temperature of less than 40°C, or less than 30°C), allowing customized formulations by salons and in office preparations by dermatologists. For conventional hydrocolloid films, cold processing is not

available, which limits the active agents and the use of hydrocolloid films to larger manufacturers.

[0192] The hydrated TPU films when tested for wet burst strength may have higher absolute peak force at break and a greater % elongation than hydrocolloid films of the same thickness so that the films may be stretched around facial or other body features without ripping and handled easily.

[0193] The exemplary TPU substrate does not support bacterial growth and can be stored for extended periods without the need for preservatives. A preservative may be included in the aqueous hydration formulation.

[0194] Without intending to limit the scope of the exemplary embodiment, the following examples illustrate polyurethane films and face mask compositions.

EXAMPLES

EXAMPLE 1: Preparation of Polyurethane Films

[0195] Polyurethane films are formed using the reactants shown in TABLE 1. Examples A-H are formed using a mixture of Polyols A and B while examples J and K use only one of the two polyols. In all the examples, Polyol A=PEG 8000 (a poly(ethylene glycol) with an average molecular weight of 8000 daltons) and Polyol C= PEG 300 (a poly(ethylene glycol) with an average molecular weight of 300 daltons).

[0196] As polyol B, PEG 1450, "1450" (a poly(ethylene glycol) with an average molecular weight of 1450 daltons) is employed. Alternatively, a polyether copolymer diol with polypropylene glycol and polyethylene oxide segments and an average molecular weight of 2000 daltons, available as Poly-G™ 55–56 ("Poly-G") from Lonza, is used.

[0197] Different polyisocyanates are evaluated: 4,4'-diisocyanato dicyclohexylmethane (H12MDI), available from Bayer as Desmodur™ W; and hexamethylene diisocyanate (HDI).

[0198] Different chain extenders are evaluated: 1,4-butanediol (bdo) and 1,10-decanediol (ddo).

[0199] As the catalyst for Examples A–H, an organotin catalyst, Cotin® 430, is used, which is a dioctyltin carboxylate, available from Vertellus Specialties Inc.

[0200] The proportions of hard, soft and intermediate segment are calculated as described above, therefore:

[0201] Wt. % soft segment = wt. % PEG-8000 + wt. % PEG-1450 + wt. % PEG-300 (or Poly-G™ 55-56).

5 [0202] Wt. % hard segment = wt. % isocyanate in hard segment + wt. % chain extender.

[0203] Wt. isocyanate in hard segment = [moles isocyanate – moles (PEG-8000 + PEG-1450 + PEG-300 (or Poly-G™ 55-56))] × Mw isocyanate

10 [0204] Wt. % intermediate segment = 100 – wt. % soft segment – wt. % hard segment.

[0205] The ratings in TABLE 1 are based on the overall performance of the compositions as a thin face mask, where 1 indicates the TPU performed poorly and 5 indicates the TPU performed exceptionally well. It is to be appreciated that the compositions may be useful in thicker face mask or for other purposes even when
15 the rating is low.

TABLE 1: TPU Compositions

TPU	Polyol A (PEG8000) wt. %	Polyol B wt. %	Diisocyanate wt. %	Polyol C (PEG300) wt. %	Chain extender wt. %
Ex. A	24.7	57.7 (1450)	15.0 H12MDI	0.99	0.99 bdo
Ex. B	24.73	57.82 (1450)	15.03 H12MDI	0.75	1.12 bdo
Ex. C	24.73	57.82 (1450)	15.11 H12MDI	0.60	1.19 bdo
Ex. D	26.29	61.25 (1450)	10.13 HDI	0.6	1.21 bdo
Ex. E	26.29	61.25 (Poly-G)	9.47 HDI	0.82	1.64 bdo
Ex. F	24.73	57.82 (Poly-G)	14.39 H12MDI	1.68	0.84 bdo
Ex. G	24.49	57.07 (1450)	14.98 H12MDI	0.65	2.27 ddo
Ex. H	24.49	57.07 (Poly-G)	14 H12MDI	0.87	3.03 ddo
Ex. J	82.5	–	13.3 H12MDI	–	3.6 bdo
Ex. K	90.5	–	7.4 H12MDI	–	1.5 bdo
Ex. L	89.52	–	7.12 H12MDI	–	2.83 ddo
Ex. M	87.04	–	8.8 H12MDI	–	3.84 ddo
Ex. N	86.6	–	10.41 H12MDI	–	2.52 bdo

TABLE 1: cont.

TPU	Wt. % hard	Wt. % Soft	Wt. % Intermediate	Rating
Ex. A	3.87	83.4	12.74	2 (weak)
Ex. B	4.21	83.15	12.64	3
Ex. C	4.43	83	12.57	4
Ex. D	3.35	88.14	8.51	1
Ex. E	4.95	88.36	6.69	1
Ex. F	5.37	84.23	10.40	5
Ex. G	5.55	82.21	12.24	4
Ex. H	7.98	82.43	9.59	4
Ex. J	14.19	82.5	3.31	1 (hard)
Ex. K	5.93	90.5	3.57	5
Ex. L	7.01	89.52	3.47	4
Ex. M	9.59	87.04	3.37	4
Ex. N	10.09	86.6	3.36	5

[0206] Ex A – H vary compositionally but generally exhibit similar water uptake, flexibility and other physical properties. Examples J – N include no Polyol B or C.

[0207] Formulations are also prepared which include a mixture of one of Examples A–H with one of Examples J and K. Additionally, formulations are prepared which include a mixture of one of examples A-K with a Carbomer homopolymer type A (Carbopol® 981F polymer, obtainable from Lubrizol Advanced Materials, Inc.)

EXAMPLE 2: Solubility Study

[0208] Some of the polymers formed in Example 1, in granular form, are heated to between 40 and 60 °C in various solvents to test solubility. If the polymer remained in solution upon cooling to room temperature, it is deemed soluble. TABLE 2 below shows the 24 hour granule swell data in water. TABLE 3 shows the amount of solvent uptake if the polymer is soluble or swollen. If swollen, then TABLE 3 shows the gm solvent/gm polymer uptake. TABLES 4 and 5 show the viscosity at various concentrations in EtOH:H₂O mixtures, as measured by Brookfield viscosity at 20 rpm.

Viscosity

[0209] Brookfield rotating spindle method (all viscosity measurements reported herein are conducted by the Brookfield method): The viscosity measurements are

calculated in centipoise (Cps), employing a Brookfield rotating spindle viscometer, Model RVT (Brookfield Engineering Laboratories, Inc.), at about 20 revolutions per minute (rpm), at ambient room temperature of about 20 to 25°C (hereafter referred to as viscosity). Spindle sizes are selected in accordance with the standard operating recommendations from the manufacturer. Generally, spindle sizes are selected as follows:

Spindle Size No.	Viscosity Range (Cps)
1	1 – 50
2	500 - 1,000
3	1,000 – 5,000
4	5,000 – 10,000
5	10,000 – 20,000
6	20,000 – 50,000
7	>50,000

[0210] The spindle size recommendations are for illustrative purposes only. The artisan of ordinary skill in the art will select a spindle size appropriate for the system to be measured.

TABLE 2: 24 hr. Granule Swell data of 3 wt. % granule form of polymer in water

Polymer	Ex. A	Ex. B	Ex. C	Ex. D	Ex. E	Ex. F	Ex. G	Ex. H	Ex. J	Ex. K	Ex. M	Ex. N
Water gm/gm	8.56	12.38	14.07	High	6.18	4.84	6.78	6.12	3.6	9.2	7.69	7.8

TABLE 3: Solubility of 3 wt. % granule form of polymer in various solvents

Polymer	Ex. A	Ex. B	Ex. C	Ex. F	Ex. K
Water gm/gm	8.56	12.38	14.07	4.84	9.2
50:50 EtOH:H ₂ O	Hazy, soluble & thin	Hazy, soluble & thin	Hazy, soluble & thin		22.67 gm/gm
95:5 EtOH:H ₂ O	Clear, soluble & thin	Clear, soluble & thin	Clear, soluble & thin		Insoluble
50:50 EtOH: ethyl acetate	Clear, soluble & thin	Clear, soluble & thin	Clear, soluble & thin		
50:50 EtOH: THF	Clear, soluble & thin	Clear, soluble & thin	Clear, soluble & thin		Insoluble
90:10 THF:H ₂ O	Clear, soluble & thin	Clear, soluble & thin	Clear, soluble & thin		

TABLE 4: Brookfield Viscosity of Polymers in 50:50 EtOH:H₂O at 20 rpm

Wt. % Polymer	Ex. A	Ex. B	Ex. C	Ex. D	Ex. E	Ex. F
4.91	thin	thin	thin			
10	360	342	274	120	110	
13.4	1392	1364	1110			
15	1280	1730	1160	350	350	
18.6	4930	3600	3880			2500
20			4950, 6640	740	720	3160

TABLE 5: Brookfield Viscosity of Polymers in 80:20 EtOH:H₂O at 20 rpm

Wt. % polymer	Ex. J	Ex. K	Ex. L	Ex. M
4.91		148		
10	Not soluble		650	210
15	Not soluble	6000		635
20	Not soluble	30,400	1450	1555

EXAMPLE 3: Soaking solution and uptake studies

- 5 [0211] The films are cast from an ethanol/water solution either with a 2 inch draw down square of set thickness or an 8 inch draw down bar with adjustable thicknesses using an automatic film applicator with vacuum plate (Byko-drive™ with vacuum plate, Material # 2121; BYK Gardner, MD, USA), at a drawdown speed of 1 in/sec. All casting solutions are centrifuged before use to remove bubbles for

30 minutes at 1500 rpm using a Thermo Electron Corporation, IEC Centra GP8 Centrifuge. The film is allowed to dry in a hood at room temperature, in air overnight. The Ex. A–C polymers give good pliable films. The Example J polymer is an extrusion grade and does not dissolve in a water/ethanol mixture and therefore could not be formed into films by casting. Ex. K dissolution is molecular weight dependent and the melt index is recommended to be above 5 to 6 if it is to be solution cast. Good solvent cast films are obtained from the highest water content: solvent combinations (50:50 EtOH:H₂O). The addition of a low level of Carbopol® polymer (1:60 Carbopol:polymer K) provides a good cast film. A casting solution for this film is formed from 0.2 wt. % Carbopol® ETD 2020, 12 wt. % Ex. K, in Ethanol:water at a weight ratio of 80/20. Studies with Ex. C and Ex. F polymers suggest that the small amount of Carbopol® ETD 2020 does not influence the film solution uptake.

[0212] Degassed blends are used to solvent cast films on polyethylene substrates (5 mil natural high density polyethylene sheets from Griff Paper and Films, PA, USA) and High density polyethylene roll from Griff Paper.

[0213] Film samples are cut into either 5 × 5 cm squares or 3 × 3 cm squares. The squares are weighed to 4 decimal places. The solvent cast squares show more variability in thickness than the extruded films. The squares are marked for the starting point and the thickness measured at four corners and averaged. The extruded film data in the tables below are measured with the X Direction being perpendicular to the extruded film and Y Direction being parallel to the extruded film.

[0214] The square is placed in approximately 50 gm of soaking solution and suspended for 30 minutes in the solution, unless noted otherwise. The square is checked to ensure it does not stick to the container or have surfaces exposed out of the solution.

[0215] At the end of soaking time, the square is removed and placed on HDPE (with no additives) and measured for X, Y and Z growth. If strong enough, it is patted dry and weighed. The wet film is then covered with another sheet of release film and placed in a sealed plastic bag for further testing. Measurements are as follows:

[0216] Area growth with time: 5 × 5 cm film samples are cut and the corners are marked with a black, water insoluble, ink to show the edges. The film is placed in a zippered polyethylene bag with 100 gm of pH 6.8 USP phosphate buffer solution and the bag with film is placed on a grid graph paper. The size is taken at a set time and recorded.

Hydrating solutions:

[0217] Solution uptake studies on the films are conducted in order to understand how ingredients in formulations will influence the properties of the film. The following soaking (hydrating) formulations are evaluated:

[0218] 1. De-ionized water.

[0219] 2. glycerin: 10 wt. % USP grade glycerin in DI water.

[0220] 3. Buffer: USP pH=6.8 phosphate buffer, formed by dissolving 6.805 g potassium phosphate monobasic and 0.896 g sodium hydroxide in water q.s., adding 1 liter of water, and adjusting the pH, if necessary, with 2N HCl or 2N NaOH. The pH is checked for 1L solution and the volume of acid/base necessary for adjustment is recorded.

[0221] 4. Aloe Vera Formulation: The formulation included Aloe vera concentrate, available as Activera™ 10X (Clear), supplied by Active Organics. (INCI Name *Aloe Barbadensis* leaf Juice). 2 wt. % of the Aloe vera concentrate is combined with 10 wt. % glycerin and water to give a final concentration of 20 wt% aloe vera in the formulation.

[0222] The formulation is preserved with a mixture of phenoxyethanol and ethylhexylglycerin supplied as Euxyl™-PE9010 by Schülke Inc. The resulting aloe formulation is as follows:

Aloe Clear Formulation:

	Wt. %	50 g
DI Water	87.48	43.74
glycerin (excipient)	10	5.00
Activera™ 10 X 10:1	2	1.00
Na ₂ EDTA	0.02	0.01
Euxyl™-PE9010	0.5	0.25
Total	100	

[0223] 5. Salicylic Acid Gel Formulation: The salicylic acid gel formulation includes 5 wt. % Curcylc™ 40 (a 40 wt. % solution of salicylic acid in a proprietary stabilizer at 60 wt. %), 10 wt. % glycerin, with a final concentration of salicylic acid of 2 wt. %. The formulation is preserved with Euxyl®-PE9010.

5 Salicylic Acid Gel Formulation

Ingredient name	Wt. %	50 g
DI Water	84.50	42.25
glycerin	10	5.00
Curcylc®40	5	2.50
(actual amount of salicylic acid)	(2)	
Euxyl®-PE9010	0.5	0.25
Total	100	

[0224] 6. Niacinamide Formulation: Niacinamide is a B-group vitamin, sometimes referred to as Vitamin PP. It is incorporated into formulations for whitening. Niacinamide is used at 2 wt. % with 10 wt. % glycerin for moisturizing. The formulation is preserved with Euxyl™-PE9010.

10 Niacinamide Formulation

Ingredient name	%w/w	50 g
Niacinamide	2	1.00
glycerin	10	5.00
Euxyl®-PE9010	0.5	0.25
DI Water	87.5	43.75
Total	100	

EXAMPLE 4: Solvent Casting of films with Actives

[0225] TABLE 6 shows solvent cast films with an example active agent (salicylic acid or a commercial salicylic acid 40% gel, Curcylc™ 40). For some of the films, a blend of TPU and Carbopol® 981NF polymer (a cross-linked poly(acrylic acid), abbreviated as “981 polymer”), is used. TABLE 7 shows the release of the active agent upon soaking. Salicylic acid content was determined by HPLC.

TABLE 6: Solvent Cast Films with Active Agents

Example	TPU Polymer	981 polymer, wt. %	Active agent	Wt. % Salicylic Acid Cast	Wt. % Salicylic Acid found
Ex. 1	Ex. C (98 wt. %)		salicylic acid 40% gel	2	1.65
Ex. 2	Ex. F (98 wt. %)		salicylic acid 40% gel	2	1.741
Ex. 3	Ex. C (96.4 wt. %)	1.61	salicylic acid	2	1.776
Ex. 4	Ex. K (96.4 wt. %)	1.61	salicylic acid	2	1.821
Ex. 5	Ex. K (96.4 wt. %)	1.61	salicylic acid 40% gel	2	1.699
Ex. 6	Ex. F (99.5 wt. %)		salicylic acid	0.5	0.43
Ex. 6	Ex. F (97 wt. %)		salicylic acid	3.0	2.76
Ex. 8	Ex. F (96 wt. %)		salicylic acid	4.0	3.70
Ex. 9	Ex. K (97.88 wt. %)	1.63	salicylic acid	0.5	0.47
Ex. 10	Ex. K (97.4 wt. %)	1.62	salicylic acid	1.0	0.83

TABLE 7: Release of active agent from films

Example	Release media	% release at 30 mins
Ex. 4	Deionized water	87.0%
Ex. 5	Deionized water	87.9%
Ex. 4	Buffer	80.8%
Ex. 5	Buffer	84.3%

Uptake rate

[0226] In detailed studies with the Ex. J and K TPUs, it is observed that the films show different rate of uptake depending upon the thickness of the film and that thicker films are found to have slower uptake. Solvent cast Ex. F is studied at 0.254 mm (10 mil) dry thickness at room temperature in the buffer.

[0227] TABLE 8 shows the rate of growth of solvent cast Ex. F at 23° C in the buffer. FIGURE 4 illustrates the results.

TABLE 8: Rate of growth of solvent cast Ex. F at 23° C in buffer

Dry Film Thickness (mm)	Time (mins)	gm/gm	volume growth cm ³ /cm ³	area growth cm ² /cm ²
	0	0.000		
0.298	5	1.983	2.141	0.988
0.275	15	2.618	3.524	1.592
0.280	30	5.025	4.355	1.856
0.313	40	4.791	4.251	1.957
0.293	60	5.018	4.222	1.855
0.275	40	4.860	4.556	1.924
0.270	60	5.108	4.505	1.958

[0228] FIGURE 5 shows results for Example F films where the soaking solution is buffer and the soak is stopped at 30 minutes and conducted at room temperature. It can be seen that the Ex. A, B, and C films are all similar in their properties. Ex. F had somewhat lower uptake. The results are shown in greater detail in TABLES 9–12.

[0229] Gm/gm growth is calculated as: $\frac{(\text{gm wet} - \text{gm dry})}{\text{gm dry}}$

[0230] Volume growth is calculated as: $\frac{(\text{Vol wet cm}^3 - \text{Vol dry cm}^3)}{\text{Vol dry cm}^3}$

[0231] Area growth (XY growth) is calculated as: $\frac{(\text{Area wet cm}^2 - \text{Area dry cm}^2)}{\text{Area dry cm}^2}$

10 [0232] Z growth is calculated as: $\frac{(\text{Thickness wet mm} - \text{thickness dry mm})}{\text{thickness dry mm}}$

TABLE 9: Growth of Example A solvent cast films in buffer at 23°C after 30 minutes

Thickness (mm)	Wt gain gm/gm	dry vol. cm ³	wet vol. cm ³	Vol. growth cm ³ /cm ³	z growth mm/mm	xy growth cm ² /cm ²
0.145	9.292	0.300	2.743	8.146	1.310	2.276
0.213	8.223	0.375	3.292	7.779	1.024	2.062
0.247	7.790	0.600	3.994	5.657	1.061	2.133
0.297	7.233	0.850	4.550	4.354	1.143	1.855
0.320	6.360	0.900	4.760	4.289	1.188	1.72
0.323	6.612	0.750	5.411	6.215	1.217	2.027

TABLE 10: Growth of EX. B solvent cast films in buffer at 23°C after 30 minutes

Thickness (mm)	Wt gain gm/gm	dry vol. cm ³	wet vol. cm ³	Vol. growth cm ³ /cm ³	z growth mm/mm	xy growth cm ² /cm ²
0.182	8.113	0.456	3.498	6.668	1.534	2.026
0.200	7.674	0.500	3.1416	5.283	1.2	1.856
0.263	6.847	0.656	4.459	5.796	1.467	1.755
0.347	6.299	0.868	5.297	5.097	1.324	1.624

TABLE 11: Growth of EX. C solvent cast films in buffer at 23°C after 30 minutes

Thickness (mm)	Wt gain gm/gm	dry vol. cm ³	wet vol. cm ³	Vol. growth cm ³ /cm ³	z growth mm/mm	xy growth cm ² /cm ²
0.117	9.151	0.294	2.008	5.835	1.064	2.312
0.173	7.716	0.425	1.694	2.987	1.739	2.133
0.195	7.177	0.488	4.045	7.298	1.590	2.204
0.285	6.234	0.700	3.342	3.775	1.465	2.062
0.290	6.438	0.725	5.141	6.091	1.483	1.856
0.367	5.105	0.850	4.712	4.544	1.388	1.755

TABLE 12: Growth of blend of EX. C and EX. K solvent cast films in buffer at 23°C after 30 minutes

Thickness (mm)	Wt gain gm/gm	dry vol. cm ³	wet vol. cm ³	Vol. growth cm ³ /cm ³	z growth mm/mm	xy growth cm ² /cm ²
0.170	8.107	0.425	3.710	7.731	1.471	2.534
0.223	7.708	0.556	4.659	7.377	1.449	2.42
0.273	6.948	0.681	5.042	6.401	1.284	2.24

TABLE 13: Growth of EX. F solvent cast films in buffer at 23°C after 30 minutes

Thickness (mm)	Wt gain gm/gm	dry vol. cm ³	wet vol. cm ³	Vol. growth cm ³ /cm ³	z growth mm/mm	xy growth cm ² /cm ²
0.130	6.175	0.325				2.497
0.310	4.531	0.775	4.463	4.759	0.83871	2.132
0.310	4.757	0.775	4.277	4.519	0.741935	2.168
0.368	4.043	0.919				1.822
0.300	4.495	0.75	4.163	4.551	0.966667	1.822

[0233] TABLE 14 shows data for the 30 (or 90) minute solution uptake for films cast from 50/50 ethanol water in buffer, deionized water, and in formulations as described above containing various active agents: Aloe vera formulation with

Activera®, niacinamide formulation, and salicylic acid gel formulation with Curcyclic™ gel. Data for some extruded films is also shown, denoted by †.

TABLE 14: Growth of solvent cast and extruded films in buffer and in hydrating formulations containing active agents at 23°C after 30 or 90 minutes

TPU Ex.	Buffer		Deionized water		Aloe vera Formulation		Salicylic acid gel Formulation		Niacinamide Formulation	
	Thick-ness (mm)	Up-take gm/gm	Thick-ness (mm)	Up-take gm/gm	Thick-ness (mm)	Up-take gm/gm	Thick-ness (mm)	Up-take gm/gm	Thick-ness (mm)	Up-take gm/gm
A	0.32	6.61			0.28	6.93	0.27	5.67		
B	0.26	6.85			0.26	637	0.27	603		
C	0.29	8.99			0.25	653			0.25	687
D	0.21	fell apart	0.21	fell apart						
E	0.31	fell apart								
F	0.28	5.02	0.31	5.34	0.31	4.60	0.25	4.57	0.25	4.49
F †	0.29	4.67	0.24	4.76	0.25	5.07	0.255	4.72	0.25	5.68
F †	0.27	4.67	0.32	4.67						
F †	0.38	4.14	0.37	4.35	0.37	4.27	0.38	4.02	0.38	4.44
J †	0.13	3.53	0.13	3.77	0.13	4.04	0.12	4.97	0.13	4.44
J †	0.38	3.80	0.37	3.94	0.41	3.83	0.38	4.19	0.37	4.10
K †	0.27	9.06	0.27	9.27	0.15	14.0	0.14	17.12		
K †	0.31	8.82	0.30	8.98	0.38	8.15	0.42	7.47		
K †	0.39	8.01	0.36	8.09	0.27	11.1	0.28	11.50		
L	0.15	9.05	0.16	9.77	0.46	6.72	0.49	5.5	0.49	6.6
M	0.18	8.50	0.22	8.49	0.33	7.57	0.29	8.20	0.29	9.04
N †	0.26	5.67					0.3*	9.79*		
N †	0.43	5.36					0.38*	8.01*		
50/50 J/K †	0.27	5.8	0.278	6.12	0.278	6.52	0.27	7.24	0.26	7.04

5 * 90 minute hydration data.

10 **[0234]** Several of the concept films were also extruded and hydrated in a similar manner as described above. The extruded films showed similar hydration as the solution cast films. The Curcyclic soaking solution shows the highest swell progressing in the following order: Curcyclic > Niacinamide > Aloe > glycerin > DI water > Buffer. Films formed from Ex. K take up between 1750 and 1200% of the initial weight in solution in the same order. The films are clear when swollen. A film

formed from a 50/50 melt mixture of Ex. J and Ex. K also takes up solution in similar order. The films are clear when swollen.

[0235] Comparison of the uptake show that the films formed from Ex. J, the 50/50 melt blend, and Ex. K swell at different rates, with Ex. J being consistently about 30% of Ex. K and approximately 60% of the 50/50 melt blend across all solutions. The Ex. K films tend to take longer to reach equilibrium than the Ex. J films of the same thickness.

[0236] The active agent remaining in films after soaking is shown in TABLES 15 and 16 for salicylic acid and niacinamide.

[0237] For the salicylic acid tests, extruded 0.24 to 0.28 mm films are hydrated in a solution containing Curcylc™ 40 (40 wt. % salicylic acid) /10 wt. % glycerin at room temperature for 30 minutes. The theoretical wt. % of salicylic acid in the hydrated polymer film is calculated by the gm/gm uptake of the solution and the concentration of the salicylic acid found in the hydrating solution.

TABLE 15: Salicylic Acid remaining in films after soaking

Example Polymer	Curcylc™ 40 in Solution, Wt. %	Salicylic Acid in solution, Wt. %	Average Solution uptake, gm/gm	Average Theoretical Salicylic acid in film, Wt. %	Average Actual Salicylic acid in film, Wt. %
EX. F	1.25	0.426	3.98	0.34	1.42
EX. F	2.5	0.849	3.84	0.67	2.08
EX. F	5	1.843	3.79	1.45	2.82
EX. F	7.5	2.758	3.64	2.16	3.29
EX. F	10	3.663	3.90	2.91	3.99
Ex. K	1.25	0.426	10.68	0.426	0.46
Ex. K	2.5	0.849	10.42	0.849	0.89
Ex. K	5	1.843	10.37	1.843	1.85
Ex. K	7.5	2.758	9.12	2.758	2.81
Ex. K	10	3.663	8.19	3.26	3.87

[0238] It can be seen that both example polymers quickly absorb salicylic acid from the solution into the hydrated polymer film. Ex F absorbs more salicylic acid from the solution, selectively concentrating the active into the film.

[0239] For the niacinamide tests, extruded 0.24 to 0.28 mm films are hydrated in a solution containing niacinamide /10 wt. % glycerin at room temperature for 30 minutes. The theoretical wt. % of niacinamide in the hydrated polymer film is

calculated by the gm/gm uptake of the solution and the concentration of the niacinamide found in the hydrating solution.

TABLE 16: Niacinamide remaining in films after soaking

Example Polymer	Niacinamide in solution, Wt. %	Average Solution uptake, gm/gm	Average Theoretical Niacinamide in film, Wt. %	Average Actual Niacinamide in film, Wt. %
EX. F	1.08%	4.59	0.89%	1.15%
EX. F	3.13%	4.96	2.61%	2.93%
EX. F	5.93%	5.28	4.98%	4.75%
EX. F	7.67%	5.76	6.54%	5.47%
Ex. K	1.08%	10.53	0.99%	1.03%
Ex. K	3.13%	11.11	2.87%	2.66%
Ex. K	5.93%	11.72	5.46%	4.28%
Ex. K	7.67%	12.03	7.08%	5.15%

[0240] It is shown that both example polymers quickly absorb niacinamide from the solution into the hydrated polymer film.

[0241] The results indicate that in Examples B and C, the about 83% PEG which is highly hydrophilic, gives the TPU greater water uptake characteristics. The hard segment formed by H12MDI (Desmodur™ W) and 1,4-butanediol provides the necessary processing and physical properties to the TPU. The TPU is soluble in 50:50 water:ethanol mixture at up to 15 wt. % solids. Thin films of 0.125 to 0.4 mm can be solvent cast on polyethylene substrates using this solution using a drawdown bar. The films dry in 8–12 hrs. and can be easily peeled off from the substrate. The films when cut in precise dimensions and soaked in excess water pick up almost 100% of water capacity within 15–30 mins, depending on film thickness. The fully hydrated films are shown to retain physical strength and flexibility and are completely transparent.

[0242] Example F is a blend of PEG–8000 and PolyG 55–56 in the soft segment. Poly G 55–56 enhances the “cling” characteristics of the hydrated film on the skin as it loses water over time. Also, increased film flexibility is obtained with the addition of PolyG 55–56. The amount of PolyG 55–56 decreases the amount of water absorbed by the polymer and balances the hydrophobic hydrophilic properties. As seen in TABLES 15 and 16, the absorption of active is also related

to the character of polyol B. Blends of polyurethanes (Ex. B or Ex. F with Ex. K) in a 50:50 ratio with are also found to have desirable characteristics. Adding a Carbopol® polymer in small quantities to the TPU solution is found to increase film strength while maintaining flexibility and water uptake properties.

5 EXAMPLE 5: Preparation of Simulated Face Masks and Transdermal Patches

a) Preparation of a Film Containing Caffeine

[0243] Simulated face masks are prepared from round samples of about 0.8 cm diameter weighing approximately 15-25 mg from a film of polymer K. The sample is placed in approximately 5 mL of soaking solution (TABLE 17) and suspended for 30
10 minutes in the solution. The sample is periodically checked to ensure it remains totally immersed in the solution. At the end of soaking time, the sample is removed and reweighed (final sample diameter, about 2.1 cm).

TABLE 17: Soaking solution containing caffeine

Ingredients (INCI)	% (w/w)
water	97.60
caffeine	2
disodium EDTA	0.2
potassium sorbate	0.1
sodium benzoate	0.1
citric acid	cs to pH 4

[0244] The concentration of caffeine in the wet polymer sample is measured by
15 HPLC and is shown in TABLE 18 (HPLC: Shimadzu Scientific Prominence System; Column: Macherey-Nagel Nucleosil™ 120-5 C₁₈, L x I.D.: 250 x 4.6 mm; Carrier Phase: A: Water, B: Methanol (65:35 v/v); Oven Temperature: Room Temperature (approx. 22°C); Flow Rate: 1 mL/min.; UV detection: 254 nm).

TABLE 18: Final concentration of caffeine after 30 min soaking period

Sample	Dry weight (mg)	Wet weight (mg)	% caffeine (w/w), vs. wet polymer
1	20.0	259.5	2.59
2	17.0	217.4	2.64
3	18.0	240.9	2.63
4	20.0	252.9	2.63
5	19.0	235.9	2.60
6	24.0	319.0	2.57

b) Preparation of a Film Containing Dimethylmethoxy Chromanyl Palmitate

[0245] Round samples (0.8 cm in diameter and 0.305 mm thick) weighing approximately 25-31 mg are prepared from a film of Polymer K. The sample is immersed in a vessel containing approximately 4 mL of a dimethylmethoxy chromanyl palmitate soaking solution (TABLE 19, all weight percents on an undiluted basis) for 30 minutes. The sample is periodically checked to ensure that it remains totally immersed in the soaking solution and does not adhere to the vessel surface. At the conclusion of the 30 min. soaking period the sample is removed from the dimethylmethoxy chromanyl palmitate solution and re-weighed (TABLE 20). The final sample diameter is about 2.0 cm.

TABLE 19: Soaking solution containing Liposomes of Dimethylmethoxy Chromanyl Palmitate

Ingredients (INCI)	% (w/w)
water	62.2
propanediol	20
lecithin	6
ethylhexyl methoxycinnamate	5
phenoxyethanol	2.6
dimethylmethoxy chromanyl palmitate	2
inulin lauryl carbamate, water, ethyl pyrrolidone	0.2

[0246] The concentration of dimethylmethoxy chromanyl palmitate in the wet polymer is measured by HPLC (TABLE 20).

TABLE 20: Final concentration of dimethylmethoxy chromanyl palmitate in % versus wet polymer and weight change after soaking with a solution containing Liposomes of dimethylmethoxy chromanyl palmitate

Sample	Dry weight (mg)	Wet weight (mg)	% Dimethylmethoxy chromanyl palmitate (w/w), vs. wet polymer
1	28.7	426.0	0.994
2	28.7	382.3	0.888
3	27.2	358.7	1.074
4	25.3	355.8	0.964
5	31.0	446.6	1.009

c) Preparation of a Film Containing Arbutin

- 5 [0247] Simulated face masks are prepared from round samples of a film of polymer K of about 0.8 cm diameter with a total weight of about 25–35 mg. The film is placed in approximately 4 mL of soaking solution containing arbutin [(2*R*,3*S*,4*S*,5*R*,6*S*)-2-Hydroxymethyl-6-(4-hydroxyphenoxy)oxane-3,4,5-triol] (TABLE 21) and suspended for 30 minutes in the solution. The sample is
- 10 periodically checked to ensure that it remains totally immersed in the soaking solution and does not adhere to the vessel surface. At the conclusion of the 30 min. soaking period the sample is removed from the arbutin solution and re-weighed. The final sample diameter is about 2.2 cm.

TABLE 21: Arbutin Soaking Solution

Ingredients (INCI)	% (w/w)
water	95.6
arbutin	4
disodium EDTA	0.2
potassium sorbate	0.1
sodium benzoate	0.1
sodium hydroxide	cs to pH 5.5

- 15 [0248] The concentration of Arbutin in the wet polymer is measured by HPLC (as described above) (TABLE 22).

TABLE 22: Final concentration of Arbutin in % versus wet polymer and weight change after soaking with a solution containing Arbutin

Sample	Dry weight (mg)	Wet weight (mg)	% Arbutin (w/w), vs. wet polymer
1	34.1	491.7	1.61
2	29.1	437.0	6142
3	30.9	453.9	1.78
4	25.7	400.0	1.42
5	32.6	497.5	1.61
6	33.2	490.6	1.45

d) Preparation of a Film Containing Acetyl Hexapeptide-37

[0249] A simulated face mask is prepared from a round piece of polymer K of about 0.8 cm diameter with a total weight of about 25–30 mg. The film is placed in approximately 5 mL of soaking solution containing acetyl hexapeptide-37 obtained from Lipotec, S.A. (TABLE 23) and suspended for 90 minutes in the solution. The sample is periodically checked to ensure that it remains totally immersed in the soaking solution and does not adhere to the vessel surface. At the conclusion of the 90 min. soaking period the sample is removed from the acetyl hexapeptide-37 solution and re-weighed. The final sample diameter is about 2.2 cm.

TABLE 23: Acetyl Hexapeptide-37 Soaking solution

Ingredients (INCI)	% (w/w)
water	49.95
butylene glycol	50
acetyl hexapeptide-37	0.05

[0250] The concentration of acetyl hexapeptide-37 in the wet polymer is measured by HPLC (TABLE 24).

TABLE 24: Final concentration of Acetyl Hexapeptide–37 in % versus wet polymer and weight change after soaking with a solution containing Acetyl Hexapeptide–37

Sample	Dry weight (mg)	Wet weight (mg)	% Acetyl Hexapeptide–37 (w/w), vs. wet polymer
1	27.2	352.2	0.0401
2	25.9	344.1	0.0379
3	26.2	341.0	0.0365
4	26.3	350.6	0.0367

e) Preparation of a Film Containing Acetyl Hexapeptide–8

[0251] A simulated face mask is prepared from a round piece of polymer K of about 0.8 cm diameter with a total weight of about 20–30 mg. The film is placed in approximately 5 mL of soaking solution containing acetyl hexapeptide–8 obtained from Lipotec, S.A. (TABLE 25) and suspended for 90 minutes in the acetyl hexapeptide–8 solution. The sample is checked to ensure it does not stick to the container or have surfaces exposed out of the solution. At the end of the 90 minute soaking time, the square is removed and weighed again (final piece diameter: 2.2 cm).

TABLE 25: Acetyl Hexapeptide-8 Soaking Solution

Ingredients (INCI)	% (w/w)
water	99.65
Phenonip™ (phenoxyethanol, methylparaben, butylparaben, ethylparaben, isobutylparaben, propylparaben)	0.3
acetyl hexapeptide–8	0.05

[0252] The concentration of acetyl hexapeptide–8 in the wet polymer is measured by HPLC, as described above (TABLE 26).

TABLE 26: Final concentration of Acetyl Hexapeptide-8 in % versus wet polymer and weight change after soaking with a solution containing Acetyl Hexapeptide-8

Sample	Dry weight (mg)	Wet weight (mg)	% Acetyl Hexapeptide-8 (w/w), vs. wet polymer
1	27.2	402.8	0.0418
2	28.9	428.5	0.0434
3	28.0	407.1	0.0425
4	23.4	338.1	0.0420

[0253] The same study is performed with a lower concentration of peptide, as follows. A round piece of the same polymer of about 0.8 cm diameter with a total weight of about 20–30 mg is placed in approximately 5 mL of soaking solution formed by a 1/5000 dilution with water of the soaking solution described in TABLE 25 and suspended for 90 minutes in the solution. The piece is checked to ensure it does not stick to the container or have surfaces exposed out of the solution. At the end of the soaking time, the square is removed from the low concentration acetyl hexapeptide-8 solution and weighed again (final piece diameter: 2.2 cm).

[0254] The concentration of acetyl hexapeptide-8 in the wet polymer is measured by HPLC (TABLE 27).

TABLE 27: Final concentration of Acetyl Hexapeptide-8 in % versus wet polymer and weight change after soaking with a dilution 1/5000 in water of a solution containing Acetyl Hexapeptide-8

Sample	Dry weight (mg)	Wet weight (mg)	% Acetyl Hexapeptide-8 (w/w), vs. wet polymer
1	27.3	355.8	0.0017
3	23.6	320.2	0.0019

f) Preparation of a Film Containing a Dimethylmethoxy Chromanyl Palmitate Fluid Emulsion

[0255] A square of polymer K of about 3x3 cm with a total weight about 444 mg is placed in approximately 200 mL of soaking emulsion containing dimethylmethoxy chromanyl palmitate (obtained from Lipotec, S.A.) (TABLE 28) and suspended for 60 minutes in the solution. The sample is periodically checked to ensure that it remains totally immersed in the soaking solution and does not adhere to the vessel surface. At the conclusion of the 60 minute soaking time, the square is removed

from the dimethylmethoxy chromanyl palmitate soaking emulsion and re-weighed (final size: 9.27x9.27 cm, final weight: 3.909 g).

TABLE 28: Soaking Solution Containing a Dimethylmethoxy Chromanyl Palmitate Emulsion

Ingredients (INCI)	% (w/w)
water	csp 100
sodium hydroxide	cs to pH 6.94
disodium EDTA	0.2
potassium sorbate	0.1
acetyl hexapeptide-8	0.05
acrylates copolymer	1
acrylates/beheneth-25 methacrylate copolymer	0.25
caprylic/capric triglyceride	33
methyl glucose dioleate	2.5
dimethylmethoxy chromanyl palmitate	2
phenoxyethanol	0.5

5 g) Preparation of a Film Containing Hyaluronic Acid

[0256] A square of polymer K of about 3x3 cm with a total weight of about 358 mg is placed in approximately 200 mL of soaking solution containing hyaluronic acid (TABLE 29) and suspended for 60 minutes in the solution. The piece is checked to ensure it does not stick to the container or have surfaces exposed out
 10 of the solution. At the end of soaking time, the square is removed and weighed again (final size: 12.3x12.3 cm, final weight: 4.164 g).

TABLE 29: Hyaluronic Acid Soaking Solution

Ingredients (INCI)	% (w/w)
water	csp 100
sodium benzoate	0.1
disodium EDTA	0.2
potassium sorbate	0.1
sodium hyaluronate	0.5

h) Preparation of Films Containing Diclofenac Sodium

[0257] 3x3 cm squares are cut from extruded films of polymers F, K and N. The weight of each square is measured by a Mettler Toledo AE100 Balance. Thickness at 4 corners is measured using a Mitutoyo Digital Thickness Gauge, and the thickness of the square is expressed as the average of the four corners. The X and Y dimensions of each square are recorded. A soaking solution is prepared according to TABLE 30. First, 10% glycerin and 0.25% Euxyl® PE9010 (a preservative) obtained from Schülke & Mayr GmbH are added to deionized water, and the solution is stirred for 15 minutes. Then, 0.84% of Diclofenac Sodium [2-(2,6-dichloranilino)phenylacetic acid], obtained from Spectrum Chemical Mfg. Corp. is added and stirred for 1 hour or until clear. Diclofenac sodium is a nonsteroidal anti-inflammatory drug (NSAID) taken or applied to reduce inflammation and as an analgesic reducing pain. The film squares are placed into the soaking solution, and saturated for 30 minutes. The sample squares are then removed from the solution and blotted dry with a paper towel. The samples are measured for weight, thickness and the X and Y dimensions. Uptake and dimension change are calculated based on the measurement above.

TABLE 30: Soaking solution containing Diclofenac Sodium

INGREDIENT	% IN WEIGHT
deionized water	88.91
glycerin	10
diclofenac sodium	0.84
Euxyl® PE9010	0.25

[0258] The active agent remaining in films after soaking is shown in TABLE 31.

[0259] For the diclofenac sodium hydration, extruded 0.33 to 0.37 mm films are hydrated in a solution containing 0.84 wt. % diclofenac sodium/10 wt. % glycerin at room temperature for 30 minutes. The theoretical wt. % of diclofenac sodium in the hydrated polymer film is calculated by the gm/gm uptake of the solution and the concentration of the diclofenac sodium found in the hydrating solution.

TABLE 31: Diclofenac Sodium remaining in films after soaking

Example Polymer	Diclofenac Sodium Solution, Wt. %	Average Solution uptake, gm/gm	Average Theoretical Diclofenac Sodium in film, Wt. %	Average Actual Diclofenac Sodium in film, Wt. %
Ex. K	0.84	10.70	0.81	1.174
Ex. N	0.64	6.12	0.59	1.095
Ex. F	0.54	6.05	0.46	0.901

[0260] It can be seen that all example polymers quickly absorb diclofenac sodium from the solutions into the hydrated polymer films. Films of K, N and F all absorb more diclofenac sodium from the hydrating solution, selectively concentrating the active into the film. Film K has a higher gm/gm solution uptake than N and F, while lower ratio of actual active amount to theoretical active amount.

i) Preparation of Films Containing Lidocaine HCl

[0261] Lidocaine HCl stabilizes the neuronal membrane by inhibiting the ionic fluxes required for the initiation and conduction of impulses, thereby effecting local anesthetic action. It is incorporated into this formulation for pain relief.

[0262] 3x3 cm squares are cut from extruded films of polymers of Ex. F, K and N and weighed and thickness measured as for Example 5h. A soaking solution is prepared according to TABLE 32. First, a phosphate buffer is prepared by adding monopotassium phosphate and sodium hydroxide to deionized water, and the pH is measured (6.8). Into the phosphate buffer, 10% glycerin and 0.25% Euxyl® PE9010 are added. The solution is stirred for 15 minutes. Then 5% Lidocaine HCl obtained from Spectrum Chemical Mfg. Corp. is added and stirred for 15 minutes. The solution is stirred for 30 minutes at room temperature before use.

[0263] The pH is measured (6.43). The film squares are placed into the soaking solution and saturated in the solution for 90 minutes. Then, the sample squares are removed from the solution and blotted dry with a paper towel. The samples are

measured for weight, thickness and the X and Y dimensions. Uptake and dimension change are calculated based on the measurement above.

TABLE 32: Soaking solution containing Lidocaine HCl (pH 6.4)

INGREDIENT	Wt. %
Phosphate Buffer (pH 6.8) in Deionized Water	83.9799
Monopotassium Phosphate	0.6805
Sodium Hydroxide	0.0896
glycerin	10
Lidocaine HCl	5
Euxyl® PE9010	0.25

[0264] Another Soaking Solution is prepared at pH 4.6 (TABLE 33).

- 5 [0265] The active agent remaining in films after soaking in Lidocaine HCl solution is shown in TABLE 33.

TABLE 33: Lidocaine Hydrochloride remaining in films after soaking

Example Polymer	Lidocaine HCl in solution, Wt. %	Average Solution uptake, gm/gm	Average Theoretical Lidocaine HCl in film, Wt. %	Average Actual Lidocaine HCl in film, Wt. %
K	5	13.12	4.98	4.921
F	5	4.29	4.98	4.947
N	5	7.32	4.50	4.600

- [0266] For the lidocaine hydrochloride hydration, films of Ex. K and F are extruded at 0.28 to 0.31 mm and are hydrated in a solution containing 5 wt. % lidocaine hydrochloride/10 wt. % glycerin (pH 6.4) at room temperature for 90 minutes. Films of Ex. N are extruded at 0.28 to 0.31 mm and are hydrated in a solution containing 5 wt. % lidocaine hydrochloride/10 wt. % glycerin (pH 4.6) at room temperature for 90 minutes. The theoretical wt. % of lidocaine hydrochloride in the hydrated polymer film is calculated by the gm/gm uptake of the solution and the concentration of the lidocaine hydrochloride found in the hydrating solution.
- 15

[0267] The results suggest that within 90-minute hydration, three example polymers absorb from the solution to form hydrated films and have different solution uptake ability. Average solution uptake rank in an increasing order is F < N < K. For all three example polymers, average actual active in film is equivalent to

average theoretical active in film, indicating they are not selectively concentrating the active into the film.

j) Release of actives from films

[0268] Release of diclofenac sodium from example films is studied as follows. Six pieces of 3 × 3 cm diclofenac sodium-containing hydrated films of each kind are cut from example films prepared in Example 5h. Each piece is placed against a glass disc and retained with a 17 mesh Teflon screen. Four Teflon clip/feet retain the assembly and position the assembly in a dissolution vessel. The transdermal patch retainer is USP 724 compliant and purchased from Quality Lab Accessories. USP dissolution apparatus 5 (paddle over disk) is applied to test active release from the example films. VK7010 with 1000 ml vessels and stainless steel paddles (obtained from Agilent) are used to perform the release test of diclofenac sodium loaded films. The dissolution vessels are loaded with 800 ml of release medium (degassed phosphate buffered saline pH=7.4). The temperature of release medium is kept at 32.0 ± 0.5 °C throughout the test (the temperature of the release medium is selected to reflect the physiological skin conditions). The paddle height is set to 2.5 cm from the bottom of the vessel to the disc. The paddle rotation speed is 50 rpm. The samples (10 ml) are withdrawn automatically by Varian VK 810 sampling station at time points 2, 5, 9, 12, 15, 20, 30, 45, 60, 90, and 120 min, and analyzed by Cary® 50 UV-Vis (Agilent, USA). TABLE 34 shows release of diclofenac sodium from the films.

TABLE 34: Release of diclofenac sodium from films

Example	Release media	% release at 120 mins
Ex. K	Phosphate buffered saline	72.7
Ex. N	Phosphate buffered saline	77.4
Ex. F	Phosphate buffered saline	77.3

[0269] Release of lidocaine HCl from example films is studied as described above for the diclofenac sodium using six pieces of 5 × 5 cm hydrated lidocaine HCl-containing films of each kind which are cut from example films prepared in Example 5i. TABLE 35 shows release of diclofenac sodium from the films.

TABLE 35: Release of lidocaine HCl from films

Example	Release media	% release at 30 mins
K	Phosphate buffered saline	87.3
F	Phosphate buffered saline	79.5

EXAMPLE 5: Preparation of Simulated Face masks and Transdermal Patches from Solvent Cast Filmsa) Stock Solutions

- 5 **[0270]** Polymer stock solutions (Solutions A, B, C) are prepared using Ex. F and K polymers and stirred at room temperature until all ingredients dissolved, according to TABLE 36 below.

TABLE 36

Ingredients	Solution A (Ex. F)	Solution B (Ex. F)	Solution C (Ex. K)
Polymer (gm)	135	288.75	150
Ethanol (gm)	307.5	288.75	480
Water (gm)	307.5	172.5	123
Wt. % polymer in Solution	18	23	19.92

b) Menthol-Containing Casting Mixtures

- 10 **[0271]** Casting mixtures of solution A and a 20 wt. % menthol stock solution (Solution D) are prepared as shown in TABLE 37 and stirred until homogeneous. Films are cast using a 2 in (5.08 cm) 100 mil (2.54 mm) draw down bar on LLDPE sheets to give clear, soft pliable films. The films are dried overnight and the thickness measured.

TABLE 37

Sample	37.1	37.2	37.3	37.4	37.5
Solution A (18 wt. % polymer) (gm)	110	110	110	110	110
Solution D (20 wt. % menthol) (gm)	1	2.5	5.21	7.45	8.61
polymer in casting solution (gm)	19.8	19.8	19.8	19.8	19.8
menthol in casting solution (gm)	0.2	0.5	1.042	1.49	1.722
Theoretical wt. % menthol in dry film	1.0%	2.5%	5.0%	7.0%	8.0%
Dry film Thickness (mm)	0.23	0.20	0.31	0.27	0.30

- 15 c) Menthol and Methyl Salicylate-Containing Casting Mixtures

[0272] Casting mixtures of solution B and a 20 wt. % menthol and 10 wt. % methyl salicylate stock solution (Solution E) are prepared as shown in TABLE 38 and stirred

until homogeneous. Films are cast using a 2 in (5.08 cm) 125 mil (3.175 mm) draw down bar on LLDPE sheets to give clear, soft pliable films. The films are dried overnight and the thickness measured.

TABLE 38

Sample	38.1	38.2	38.3	38.4	38.5
Solution B (polymer) (gm)	64	62	60	59	58
Solution E (20 wt. % menthol and 10 wt. % methyl salicylate) (gm)	1.52	3.03	4.55	6.17	7.85
polymer in casting solution (gm)	14.72	14.26	13.8	13.57	13.34
menthol in casting solution (gm)	0.304	0.606	0.91	1.234	1.57
methyl salicylate in casting solution (gm)	0.152	0.303	0.455	0.617	0.785
Theoretical wt. % menthol	2%	4%	6%	8%	10%
Theoretical wt. % methyl salicylate	1%	2%	3%	4%	5%
Dried film thickness(mm)	0.41	0.38	0.34	0.4	0.31

- 5 **[0273]** A stock solution containing Carbopol® 981 (Solution F) is prepared according to TABLE 39.

TABLE 39

Ingredient	Solution F
Polymer (Carbopol® 981) (gm)	6
Ethanol (gm)	197
Water (gm)	197
Tris (30%) (gm)	11.5
Wt. % polymer	1.46

- 10 **[0274]** Polymer Solution C (470 gm) is mixed with Carbopol® solution F (104.4) to give a Stock Solution G containing 0.26 wt. % Carbopol® 981.

d) Menthol/Carbopol-Containing Casting Mixtures

- 15 **[0275]** Casting mixtures of the Stock solution G (containing polymer with Carbopol® 981) and the stock Solution D (menthol) at the indicated concentrations shown in TABLE 40 are combined and stirred until homogeneous. Films are cast using a 2 in (5.08 cm) 125 mil (3.175 mm) draw down bar on HDPE and dried overnight to give white films of the indicated thickness.

TABLE 40

Sample	40.1	40.2	40.3	40.4	40.5
Solution G (14.1 wt. % Ex. K) polymer (gm)	110	110	110	110	110
Solution D (20 wt. % menthol) (gm)	0.91	2.45	5.02	6.46	7.33
polymer in casting solution (gm)	15.51	15.51	15.51	15.51	15.51
menthol in casting solution (gm)	0.182	0.49	1.004	1.292	1.466
Theoretical wt. % menthol in film	1.2	3.1	6.1	7.7	8.6
Dried film thickness (mm)	0.40	0.40	0.55	0.24	0.34

e) Menthol and Methyl Salicylate/Carbopol-Containing Casting Mixtures

5 [0276] Casting mixtures of the Stock solution G (containing polymer with Carbopol® 981) and the stock Solution E (menthol and methyl salicylate) at the indicated concentrations shown in TABLE 41 are combined and stirred until homogeneous. Films are cast using a 2 in (5.08 cm) 125 mil (3.175 mm) draw down bar on HDPE and dried overnight to give white films.

TABLE 41

Sample	41.1	42.2	42.3	42.3	42.3
Solution G (14.1 wt. Ex. K) (gm)	110	110	110	110	110
Solution E (20 wt. % menthol and 10 wt. % methyl salicylate) (gm)	1.86	3.72	5.66	7.66	9.72
polymer in casting solution (gm)	15.51	15.51	15.51	15.51	15.51
menthol in casting solution(gm)	0.372	0.744	1.132	1.532	1.944
methyl salicylate in casting solution(gm)	0.186	0.372	0.566	0.766	0.972
Theoretical wt. % menthol in film	2%	4%	7%	9%	11%
Theoretical wt. % methyl salicylate in film	1%	2%	3%	4%	5%

f) Capsaicin-Containing Casting Mixtures

10 [0277] A stock solution (Solution H) is prepared from 0.0762 gm Capsaicin in 25 ml ethanol (0.003104 mg/μl Capsaicin).

[0278] Stock Solution A (18 wt. % polymer) is prepared using the same weight percent of ingredients as used in TABLE 35.

15 [0279] Stock Solution A and stock Solution H are combined in the amounts shown in TABLE 42 and are blended until homogeneous. Films are cast using a 2 in (5.08 cm) 100 mil (2.54 mm) 2 draw down bar on LDPE sheets to give clear soft pliable films. The films are dried overnight and the dried thickness measured. Capsaicin content was measured by HPLC.

TABLE 42: Capsaicin Films

Sample	43.1	43.2	43.3
Solution A (18 wt. % polymer Ex. F) (ml)	90	90	90
Capsaicin stock solution H (ml)	2.7	5.4	13.5
Polymer in casting solution (gm)	16.2	16.2	16.2
Capsaicin in casting solution (gm)	0.00823	0.016459	0.041148
Theoretical wt. % capsaicin in film	0.05%	0.10%	0.25%
Dried film thickness (mm)	0.23	0.24	0.25
Measured Capsaicin in Film (wt. %)	0.0476%	0.0946%	0.248%

g) Wet Patch with Cover

[0280] A 12 mil (0.3 mm) thick extruded film of Ex. K produced from Stock Solution C (19.92 wt. % polymer) is hydrated in the Aloe Vera Clear formulation of Example 3 for 30 minutes to produce a 2x5 cm hydrated patch. The patch is placed on the forearm and covered to hold it in place by an adhesive transparent film dressing – Tegaderm™ (3M Company). The adhesive dressing is 4 in (10.16 cm) by 4.75 in (12.065 cm). The hydrated patch is held in place for 0.5 hours and then removed demonstrating the utility of the hydrated patch as a dermal delivery system under a barrier film.

EXAMPLE 6: Skin Studiesa) Skin Study with Caffeine

[0281] A percutaneous absorption study is performed on pig skin test samples obtained from the back of domestic pigs (*Sus domesticus*) weighing about 30 kg. The pig skin is dermatomed to a thickness of about 500 microns and then test discs having a diameter of 2.5 cm are sectioned from the dermatomed skin. An extruded polymer film of polymer K is loaded is with 1.8% caffeine (as described for Example 5A). The loaded films are applied to the sample discs (in contact with the stratum corneum) for 30 minutes. Different layers of the film treated skin (stratum corneum, epidermis and dermis) are separated, assayed and analyzed for the quantity of caffeine and permeation into the respective layers of the skin. The quantitative analysis for caffeine and is conducted by HPLC utilizing the instrumentation identified above.

[0282] Additionally, the same solutions utilized to load the polymer films are topically applied across the entire surface of the stratum corneum of comparative pig skin disc samples prepared as above. The topically treated discs are allowed to stand for 30 mins. before being assayed. The topically coated discs are used to

5 compare the impact of the application of the active ingredient loaded polymer film with topical application of active ingredients on dermal absorption. The OECD 428 methodology (OECD Guideline for the testing of chemicals: Skin absorption: in vitro Method, Paris, adopted 13 April 2004) is followed for the experimental design.

[0283] The treated skin discs are placed between the upper and the lower

10 chambers of a Franz diffusion cell (PermeGear, Inc., Hellertown, PA) with a contact area of 1.77 cm^2 . The lower chamber contained the receptor fluid (PBS solution, Sigma-Aldrich Co. LLC). The integrity of the skin is evaluated by measuring the transepidermal water loss (TEWL). Only the sample discs with a TEWL value lower than $15 \text{ g/m}^2\cdot\text{hr.}$ are used in the experiment. A value higher than $15 \text{ g/m}^2\cdot\text{hr.}$ could

15 indicate the presence of a hole in the biopsied skin sample. The receptor fluid is collected, and the bottom of the skin is washed with distilled water and added to the receptor fluid to a final volume of 10 mL with extraction solution (H_2O , pH 3.0). The collected receptor fluid is analyzed by HPLC as described above. No caffeine was present in the analyzed fluids indicating that the active remained in the skin

20 samples.

[0284] The quantities of caffeine that permeated into each of the three different layers of the skin samples (stratum corneum, epidermis and dermis) are collected separately as follows. To remove residual formulation remaining on the surface of the stratum corneum of the skin samples, the skin surface is washed once with a

25 surfactant solution (0.5 wt. % sodium dodecyl sulfate in water) and twice with pure water. The stratum corneum of the treated skin samples is adhesively separated from the underlying layers by applying 10 adhesive strips on the skin surface at a constant pressure (100 g/cm^2) for 5 seconds. In order to minimize the damage on the dermoepidermal junction, the strips are applied and removed in different

30 directions (rotations of 90°). All of the strips (containing the adhered stratum corneum cells) are placed in 2 mL of extraction solution.

[0285] The epidermis is separated from the dermis by heating the remaining skin samples at 80°C for approximately 5 seconds. The remaining separated

epidermis layer also is placed in 1 mL of extraction solution. The remaining dermis layer is cut into small pieces and placed in 1 mL of extraction solution. The exacted actives for each of the skin layers are assayed by HPLC described above to determine the quantity of active that permeated into each layer of the pig skin test sample.

[0286] Additionally, a caffeine solution with the same concentration of caffeine is used to compare the impact of the polymer on dermal absorption.

[0287] Additionally, the water activity of the dried polymer is studied in order to analyze possible microbiological risks. The water activity is the partial vapor pressure of water in a substance divided by the standard state partial vapor pressure of water. When the value is lower there is less risk of microbiological contamination.

[0288] In parallel, a sensory evaluation was conducted by a panel of Asian participants on several key cosmetic attributes to assess the robustness and in-use sensory experience offered by the polymer hydrogel film compared to classic facial mask sheets.

[0289] The polymer loaded with caffeine allows applying a very high concentration of caffeine, much more than that specified in the OECD 428 guideline. For that reason, four different experiments are done with the same concentration of caffeine.

1. 1.8% caffeine in the experimental polymer film, applied for 30 minutes (50 mg total caffeine applied).
2. 1.8% caffeine in water solution, applied for 30 minutes (50 mg total caffeine applied).
3. 1.8% caffeine in water solution, applied for 30 minutes under OECD 428 amounts (0.3 mg total caffeine applied).
4. 1.8% caffeine in water solution, applied for 24 hours under OECD 428 amounts (0.3 mg total caffeine applied).

[0290] The results of the Franz cell studies suggest that the exemplary polymer hydrogel increases, by more than 3 times, the amount of caffeine found in the skin layers as compared to the same caffeine amount applied in a single lotion after only 30 minutes of application (see FIGURE 6).

[0291] Additionally, another hydrogel polymer film which one (with a different thickness) is tested against a typical benchmark mask made of Biocellulose in order to compare caffeine permeation. Results comparing the exemplary polymer film versus Biocellulose suggest that the polymer hydrogel increases by more than 2 times the amount of caffeine found in the skin layers compared to the same caffeine amount applied in Biocellulose after only 30 minutes of application (FIGURE 7).

[0292] Results relating to microbiological risk, using analysis by water activity measurements are shown in TABLE 43.

10 **TABLE 44: Comparison of microbiological analysis of the exemplary experimental polymer film vs Biocellulose**

	Exp. Polymer	Biocellulose
Temperature (°C)	24	23.5
Relative Humidity (%)	51.8	54.5
Water activity	0.48	0.55

[0293] According to ISO 11930 “*Evaluation of antimicrobial protection of a cosmetic product*”, when a cosmetic product is a formulation intrinsically hostile to microbial growth and it needs specific manufacturing conditions, packaging type and/or condition for use, the ISO 29621 “*Guidelines for the risk assessment and identification of microbiologically low-risk products*” are applied. According to these guidelines, if the water activity (WA) is below 0.5, the product is hostile to microbial growth. In this case, there is no need of preservatives in the dried polymer to avoid microbiological contamination.

20 [0294] During the sensory evaluation, the panel noticed face masks made from polymer hydrogel offered a more pleasing experience than the classic face mask sheets due to better handling resistance, better aesthetics and softness, higher transparency, and absence of residue upon removal.

b) Skin Study with dimethylmethoxy chromanyl palmitate

25 [0295] The same experiment is performed as in Example 6a, but in this case using a lipophilic whitening ingredient (dimethylmethoxy chromanyl palmitate). In this case, two different experiments are performed with the same concentration of dimethylmethoxy chromanyl palmitate.

1. 2% Dimethylmethoxy chromanyl palmitate in the polymer hydrogel, applied for 30 minutes (387 mg total applied).
2. 2% Dimethylmethoxy chromanyl palmitate encapsulated in liposomes, applied for 30 minutes (387 mg total applied).

5 **[0296]** In this study, dimethylmethoxy chromanyl palmitate penetrates much more from the film polymer than from the liposomes (FIGURE 8). Results are even better than for the hydrophilic active (caffeine), obtaining around ten times more skin permeation than the active inside the liposome, which is a conventional delivery system to increase skin permeation.

10 c) Skin Study with salicylic acid

[0297] A skin permeation study is performed on dermatomed human cadaver skin, thickness ranging 400-1500 μm , surface area of 0.25 ft^2 (0.093 m^2) obtained from The New York Firefighters Skin Bank. Skin is cut into about 2 cm^2 pieces with sterilized scissors, and soaked in filtered pH 7.4 phosphate buffered saline (PBS)
15 at room temperature for 15-30 minutes to allow thawing. Then, a Franz diffusion cell is assembled with thawed skin, connected to a circulating water bath system, and equilibrated to 37°C for at least 15-30 minutes.

[0298] A circular area of a drug loaded film is cut using a biopsy punch that fits 0.64 cm^2 area of skin. The drug loaded film is prepared as described in TABLE 15.
20 The circular pieces are applied as the donor on the skin with aid of a glass rod. After preparation, the donor compartment is left non-occluded exposing to air. In addition, 3 to 5 pieces of these circular films are analyzed for salicylic acid content by HPLC.

[0299] For the solution samples, a certain volume of the solution that contains a similar salicylic acid content to the circular film pieces is applied on the skin using
25 pipet. Five replicates per sample are performed.

[0300] The loaded films or solutions are applied to the skin (in contact with the stratum corneum) for 30 minutes. Then film or sample is removed and collected in centrifuge tube. A Q-tip soaked with PBS is used to gently wipe the skin to remove
30 excess formulation and is collected along with the film. Sample will further be storage at 4 °C.

[0301] To collect stratum corneum, 3M Scotch Book Tape 845 is cut into 1.5 cm² pieces for tape stripping. The PBS-washed skin is mounted on aluminum foil plus a support using 4 pins (one on each corner). The skin sample is sandwiched between a pre-cut plastic sheet with circular area of 0.64 cm² and aluminum foil. The skin is
5 stripped 20 times with 1.5 cm² 3M Scotch Book Tape 845 by pressing gently with a spatula to the area that was exposed to the formulation. The 20 tapes are pooled into one sample and extracted with 10 ml of methanol in a 37°C water bath overnight. Then the samples are stored at 4 °C until HPLC analysis.

[0302] After tape stripping, the area of the viable epidermis and dermis that has
10 been in contact with the formulation is further cut into small pieces with sterile scissors. The small pieces of skin are collected in micro-homogenizer tubes. Samples are incubated in a 37°C water bath overnight. The samples are then subjected to homogenization using a micro tube homogenizer. The samples are then centrifuged and the supernatant is collected in HPLC vials. The samples are
15 stored at 4 °C until HPLC analysis.

[0303] All of the 5 mL of receptor compartment is collected into a 15 mL polypropylene tube, lyophilized and stored at 4 °C until HPLC analysis.

[0304] Polymer K, D and L loaded with salicylic acid are tested in the skin permeation study, and a hydroalcoholic solution with 10% ethanol is tested as a
20 reference to determine any improved permeation effect by the films:

2% salicylic acid in the experimental polymer film K, applied for 30 minutes.

4% salicylic acid in the experimental polymer film D, applied for 30 minutes.

2% salicylic acid in the experimental polymer film L, applied for 30 minutes.

2% salicylic acid in hydroalcoholic solution, applied for 30 minutes.

[0305] The results of the skin permeation study suggest that the exemplary
25 polymer K improves salicylic acid permeation in the stratum corneum, compared to hydroalcoholic solution which contains 10% ethanol to increase skin permeation (see FIGURE 9).

d) Skin Study with Lidocaine HCl

[0306] Skin preparation and assembling of the Franz diffusion cell was
30 performed as for the skin study with salicylic acid.

[0307] The loaded films or commercial patch are applied to the skin (in contact with the stratum corneum) for 24 hours. 300 µl of the receptor compartment media is withdrawn at 0.5, 1, 2, 4, 8 and 24 hours for HPLC analysis, and replaced with 300 µl of fresh PBS. At 24 hours, the donor compartment (film or patch sample) is removed and collected in a centrifuge tube. A Q-tip soaked with PBS is used to gently wipe the skin to remove excess formulation and is collected along with the sample film or patch. Samples are lyophilized and dispersed in 10 ml methanol and stored at 4 °C until HPLC analysis.

[0308] The area of the skin is that has been in contact with the formulation is further cut into small pieces with sterile scissors. The small pieces of skin are collected in micro homogenizer tubes and 1 ml of methanol added to each tube. Samples are stored in the fridge until being subjected to homogenization using the micro tube homogenizer. Then, the samples are centrifuged and the supernatant is collected in HPLC vials. The samples are stored at 4 °C until HPLC analysis.

[0309] Polymer K and D loaded with lidocaine HCl are tested in a skin permeation study, and one commercial patch is tested to compare to the experimental films:

5% lidocaine HCl in polymer film K

5% lidocaine HCl in polymer film D

5% lidocaine base in the commercial patch

[0310] The results of the skin permeation study suggest that the exemplary polymer K increases lidocaine HCl penetration in skin, 2 times higher than that from commercial patch in the first 8 hours (see FIGURE 10). Film D also induces higher drug penetration than commercial patch within 24 hour application, and shows higher penetration percentage than Film K in the long term (16-24 hours).

e) Skin Study with Diclofenac Sodium

[0311] Skin preparation and assembling of the Franz diffusion cell was performed as for the skin study with salicylic acid.

[0312] Study time and sampling time points follow the details in skin study with lidocaine HCl.

[0313] Sample preparation for HPLC analysis is performed as for the skin study with lidocaine HCl.

[0314] Polymer K and L loaded with diclofenac sodium are tested in skin permeation study, and 1 commercial patch is tested to compare to the experimental films:

1% diclofenac sodium in the experimental polymer film K

5 1% diclofenac sodium in the experimental polymer film L

1.3% diclofenac epolamine in the commercial patch

[0315] The results of the skin permeation study suggest that the exemplary polymers K and L dramatically increase diclofenac sodium penetration in skin, which compared to commercial patch, allow for earlier drug detection in skin and
10 four times higher drug permeation percentage at 24 hour (see FIGURE 11).

[0316] These studies demonstrate facial masks made from the exemplary polymer hydrogels improve skin penetration of active ingredients for better performance or formulation cost optimization. Due to the strong mechanical properties, high clarity, better sensory perception, and being not conducive to
15 microbial growth of bacteria, the results suggest that the exemplary film is highly suited to facial masks.

[0317] Each of the documents referred to above is incorporated herein by reference in its entirety, as is the priority document and all related applications, if any, of which this application claims the benefit. Except in the Examples, or where
20 otherwise explicitly indicated, all numerical quantities in this description specifying amounts of materials, reaction conditions, molecular weights, number of carbon atoms, and the like, are to be understood as modified by the word "about." Unless otherwise indicated, each chemical or composition referred to herein should be interpreted as being a commercial grade material which may contain the isomers,
25 by-products, derivatives, and other such materials which are normally understood to be present in the commercial grade. However, the amount of each chemical component is presented exclusive of any solvent or diluent oil, which may be customarily present in the commercial material, unless otherwise indicated. It is to be understood that the upper and lower amount, range, and ratio limits set forth
30 herein may be independently combined. Similarly, the ranges and amounts for each element of the invention may be used together with ranges or amounts for any of the other elements.

[0318] It will be appreciated that variants of the above-disclosed and other features and functions, or alternatives thereof, may be combined into many other different systems or applications. Various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be
5 subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

WHAT IS CLAIMED IS:

1. A polymer film comprising:

a) at least 30 wt. % of a thermoplastic polyurethane polymer which is the reaction product of:

5 a first polyether polyol having a molecular weight of at least 3000 daltons;

optionally, a second polyether polyol having a molecular weight of no more than 2500 daltons;

at least one of:

10 a third polyol having a molecular weight of up to 800 daltons, and

a chain extender;

a diisocyanate; and

optionally, a catalyst; and

b) up to 5 wt. % water.

15 2. The polymer film of claim 1, wherein the thermoplastic polyurethane polymer has a hard segment content of at least 4 wt. %.

3. The polymer film of claim 1 or 2, wherein the thermoplastic polyurethane polymer has a hard segment content of up to 12 wt. %.

20 4. The polymer film of any one of claims 1-3, wherein the thermoplastic polyurethane polymer has a hard segment content of up to 10 wt. %.

5. The polymer film of any one of claims 1-4, wherein the thermoplastic polyurethane polymer has a soft segment content of at least 80 wt. %.

6. The polymer film of any one of claims 1-5, wherein the film includes at least 50 wt. % of the thermoplastic polyurethane.

25 7. The polymer film of any one of claims 1-6, wherein the film includes at least 80 wt. % of the thermoplastic polyurethane.

8. The polymer film of any one of claims 1–7, wherein the first polyether polyol has a molecular weight of at least 4000 daltons.

9. The polymer film of any one of claims 1–8, wherein the first polyether polyol has a molecular weight of at least 6000 daltons.

5 10. The polymer film of any one of claims 1–9, wherein the first polyether polyol has a molecular weight of up to 15,000 daltons.

11. The polymer film of any one of claims 1–10, wherein the first polyether polyol has a molecular weight of up to 12,000 daltons.

10 12. The polymer film of any one of claims 1–11, wherein the first polyether polyol has a molecular weight of up to 10,000 daltons.

13. The polymer film of any one of claims 1–12, wherein the thermoplastic polyurethane polymer includes the second polyether polyol.

14. The polymer film of claim 13, wherein the second polyether polyol has a molecular weight of no more than 2000 daltons.

15 15. The polymer film of any one of claims 13–14, wherein the second polyether polyol has a molecular weight of no more than 1600 daltons.

16. The polymer film of any one of claims 13–15, wherein the second polyether polyol has a molecular weight of at least 800 daltons.

20 17. The polymer film of any one of claims 13–16, wherein the second polyether polyol has a molecular weight of at least 1000 daltons.

18. The polymer film of any one of claims 13–17, wherein a ratio of the molecular weight of the first polyether polyol to the second polyether polyol is at least 1.4:1.

19. The polymer film of any one of claims 13–18, wherein a ratio of the molecular weight of the first polyether polyol to the second polyether polyol is at least 2:1.

20. The polymer film of any one of claims 1–19, wherein at least one of the first polyether polyol and the second polyether polyol is of the general form:

$\text{HO}-(\text{R}^1(\text{R}^2)\text{O})_n-\text{H}$, where:

R^1 is selected from C_2 – C_4 alkyl groups and mixtures thereof, such as CH_2CH ,

R^2 is selected from H and C_1 – C_2 alkyl groups and mixtures thereof, and

n is an integer which represents the average number of ether units by weight in each polyol, and where n is at least 20.

21. The polymer film of claim 20, wherein a ratio of the value of n for the first polyether polyol to the value of n for the second polyether polyol is at least 1.5:1.

22. The polymer film of any one of claims 20–21, wherein a ratio of the value of n for the first polyether polyol to the value of n for the second polyether polyol is at least 2:1.

23. The polymer film of any one of claims 20–22, wherein a ratio of the value of n for the first polyether polyol to the value of n for the second polyether polyol is at least 3:1.

24. The polymer film of any one of claims 20–23, wherein a ratio of the value of n for the first polyether polyol to the value of n for the second polyether polyol is at least 4:1.

25. The polymer film of any one of claims 20–24, wherein a ratio of the value of n for the first polyether polyol to the value of n for the second polyether polyol is up to 20:1.

26. The polymer film of any one of claims 20–25, wherein a ratio of the value of n for the first polyether polyol to the value of n for the second polyether polyol is up to 10:1.

27. The polymer film of any one of claims 13–26, wherein a ratio by weight of the second polyether polyol to the first polyether polyol is at least 1:1.

28. The polymer film of any one of claims 13–27, wherein a ratio by weight of the second polyether polyol to the first polyether polyol is at least 1.5:1.

29. The polymer film of any one of claims 13–28, wherein a ratio by weight of the second polyether polyol to the first polyether polyol is up to 5:1.

30. The polymer film of any one of claims 1–29, wherein the third polyol has a molecular weight of up to 500 daltons.

31. The polymer film of any one of claims 1–30, wherein the third polyol has a molecular weight of at least 250 daltons.

32. The polymer film of any one of claims 1–31, wherein the chain extender has a molecular weight of up to 300 daltons.

33. The polymer film of any one of claims 1–32, wherein the diisocyanate is selected from cycloaliphatic and aromatic diisocyanates.

34. The polymer film of any one of claims 1–33, wherein the thermoplastic polyurethane polymer is 5–11 wt. % hard segment, 84–91 wt. % soft segment, and 2.5–4 wt. % intermediate segment.

35. The polymer film of claim 34, wherein the thermoplastic polyurethane polymer is 9–11 wt. % hard segment, 84–88 wt. % soft segment, and 3–4 wt. % intermediate segment.

36. The polymer film of any one of claims 1–35, wherein the film further includes at least one cross–linked poly(acrylic acid) polymer.

37. The polymer film of claim 36, wherein a ratio by weight of the thermoplastic polyurethane polymer to cross–linked poly(acrylic acid) polymer is at least 5:1.

5 38. The polymer film of any one of claims 36–37, wherein a ratio by weight of the thermoplastic polyurethane polymer to cross–linked poly(acrylic acid) polymer is at least 10:1.

39. The polymer film of any one of claims 36–38, wherein a ratio by weight of the thermoplastic polyurethane polymer to cross–linked poly(acrylic acid) polymer is up
10 to 100:1.

40. The polymer film of any one of claims 1–39, wherein the film further includes at least one other thermoplastic polyurethane which is different from the thermoplastic polyurethane polymer.

41. The polymer film of claim 40, wherein a ratio by weight of the thermoplastic
15 polyurethane polymer to the total amount of the at least one other thermoplastic polyurethane is at least 1:2.

42. The polymer film of any one of claims 38–39, wherein a ratio by weight of the thermoplastic polyurethane polymer to the total amount of the at least one other thermoplastic polyurethane is at least 1:1.

20 43. The polymer film of any one of claims 38–40, wherein a ratio by weight of the thermoplastic polyurethane polymer to the total amount of the at least one other thermoplastic polyurethane is up to 100:1.

44. The polymer film of any one of claims 1–43, wherein the film has a thickness of up to 1 mm.

45. The polymer film of any one of claims 1–44, wherein the film has a thickness of up to 0.6 mm.

46. The polymer film of any one of claims 1–45, wherein the film has a thickness of up to 0.4 mm.

5 47. The polymer film of any one of claims 1–46, wherein the film has a thickness of up to 0.3 mm.

48. The polymer film of any one of claims 1–47, wherein the film has a thickness at least 0.08 mm.

10 49. The polymer film of any one of claims 1–48, wherein the film has a thickness at least 0.1 mm.

50. The polymer film of any one of claims 1–49, wherein the film includes at least one active agent.

51. The polymer film of any one of claims 1–50, wherein the at least one active agent is present at a concentration of at least 0.00001 wt. % of the film.

15 52. The polymer film of claim 51, wherein the at least one active agent is present at a concentration of at least at least 0.0001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, or at least 0.1 wt. %, or at least 0.2 wt. %, or at least 0.4 wt. %, or at least 1 wt. %, or about 2 wt. %, or up to 20 wt. %, or up to 18 wt. %, or up to 16 wt. %, or up to 10 wt. %, or up to 5 wt. % of the film.

20 53. The polymer film of any one of claims 50–52, wherein the at least one active agent includes at least one of the group consisting of a skin whitening or depigmentation agent, an anti-acne agent, and an anti-wrinkle or anti-aging agent.

54. The polymer film of claim 53, wherein the skin whitening or depigmentation agent is selected from the group consisting of ascorbic acid, hydrogen peroxide,

magnesium ascorbyl phosphate, aminopropyl ascorbyl phosphate, nicotinamide, kojic acid, hydroquinine, mulberry root extract, liquorice root extract, *Scutellaria baicalensis* extract, grape extract, ferulic acid, hinokitiol, arbutin, α -arbutin, dimethylmethoxy chromanyl palmitate, and mixtures thereof.

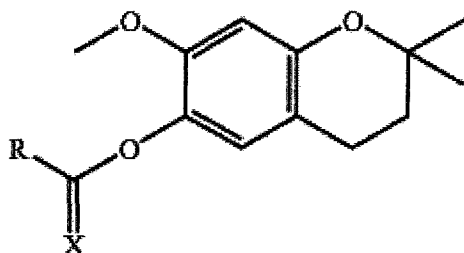
5 55. The polymer film of any one of claims 53–54, wherein the skin whitening or depigmentation agent is present at a concentration of at least at least 0.00001 wt. %, or at least 0.0001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, or at least 0.1 wt. %, or at least 0.2 wt. %, or at least 0.4 wt. %, or at least 1 wt. %, or up to 5 wt. %, or about 2 wt. % of the film.

10 56. The polymer film of any one of claims 53–55, wherein the anti-acne agent is selected from the group consisting of salicylic acid, glycolic acid, lactobionic acid, azelaic acid, benzoyl peroxide, antibiotics, retinoids, and mixtures thereof.

15 57. The polymer film of any one of claims 53–56, wherein the anti-acne agent is present at a concentration of at least 0.00001 wt. %, or at least 0.0001 wt. %, or at least 0.001 wt. %, or at least 0.01 wt. %, or at least 0.1 wt. %, or at least 0.2 wt. %, or at least 0.4 wt. %, or at least 1 wt. %, or about 2 wt. %, or up to 5 wt. % of the polymer film.

20 58. The polymer film of any one of claims 53–57, wherein the anti-wrinkle agent is selected from the group consisting of dipeptide–4, tripeptide–1, acetyl tetrapeptide–2, palmitoyl tetrapeptide–7, caprooyl tetrapeptide–3, pentapeptide–3, pentapeptide–18, dipeptide diaminobutyroyl benzylamide diacetate, palmitoyl tripeptide–5, acetyl tetrapeptide–5, acetyl tetrapeptide–9, acetyl tetrapeptide–11, acetyl tetrapeptide–22, hexapeptide–9, acetyl heptapeptide–4, palmitoyl pentapeptide–4, acetyl hexapeptide–8, acetyl hexapeptide–30, acetyl octapeptide–3, palmitoyl hexapeptide–19, diaminopropionoyl tripeptide–33, methylsilanol mannuronate, methylsilanol
25 hydroxyproline aspartate, tripeptide–9 citrulline, tripeptide–10 citrulline, acetyl tripeptide–30 citrulline, calcium hydroxymethionine, teprenone, palmitoyl oligopeptide, acetylgarginyltryptophyl diphenylglycine, dimethylmethoxy chromanol, dimethylmethoxy chromanyl palmitate, dipalmitoyl hydroxyproline, *Pseudoalteromonas ferment* extract, and mixtures thereof.

59. The polymer film of any one of claims 53–58, wherein the anti-wrinkle agent is a compound of general formula (I)

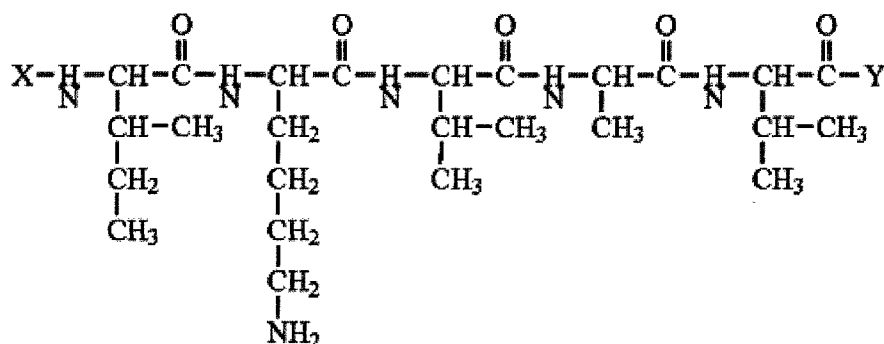


- and cosmetically or pharmaceutically acceptable salts thereof, wherein R is a linear or branched, saturated or unsaturated substituted or unsubstituted aliphatic group containing 2 to 23 carbon atoms, or a cyclic group, and wherein when R is an unsubstituted aliphatic group, its substituents are selected from hydroxy, alkoxy, amino, carboxyl, cyano, nitro, alkylsulfonyl or halogen atoms; and X is selected from O and S.

60. The polymer film of any one of claims 50–59, wherein the at least one active agent includes a peptide comprising no more than 30 amino acids.

61. The polymer film of claim 60, wherein the peptide is selected from the group consisting of:

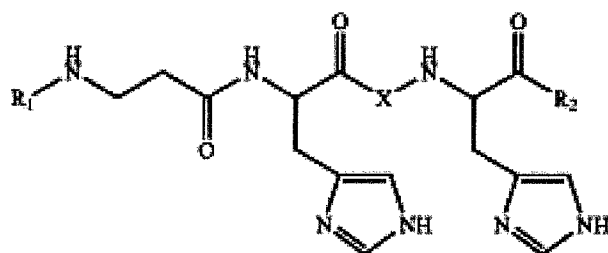
- a) a peptide comprising a sequence of at least 3 and no more than 30 adjacent amino acids from the amino end of protein SNAP–25;
- b) a peptide of general formula: X–SEQ ID NO. 1–Y:



wherein X is selected from the group consisting of hydrogen, an amino acid and an acyl group and Y is selected from the group consisting of amino, hydroxyl and thiol;

- c) a peptide of the general formula R_1-AA-R_2 its stereoisomers, mixtures thereof, and its cosmetically and pharmaceutically acceptable salts, wherein AA is a sequence of a least 3 and up to 40 adjacent amino acids contained in the amino acid sequence SEQ ID No.: 1 selected from
- MAEDADMRNELEEMQRRADQL, ADESLESTRRMLQLVEESKDAGI,
 ELEEMQRRADQLA, ELEEMQRRADQL, ELEEMQRRADQ,
 ELEEMQRRAD, ELEEMQRRRA, ELEEMQRR, LEEMQRRADQL,
 LEEMQRRADQ, LEEMQRRAD, LEEMQRRRA, LEEMQRR,
 EEMQRRADQL, EEMQRRADQ, EEMQRRAD, EEMQRRRA, EEMQRR,
 LESTRRMLQLVEE, NKDMKEAEKNLT, KNLTDL,
 IMEKADSNKTRIDEANQRATKMLGSG, SNKTRIDEANQRATKMLGSG,
 TRIDEANQRATKMLGSG, DEANQRATKMLGSG, NQRATKMLGSG and
 QRATKMLGSG;

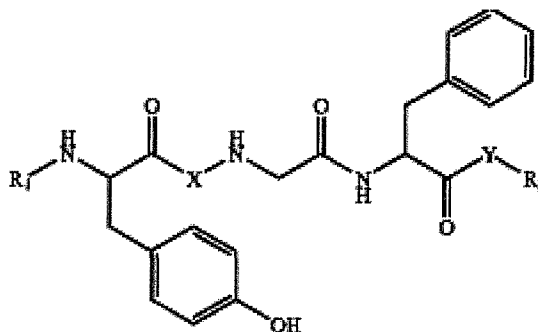
- d) a peptide of general formula:



where X is selected from cysteinyl, seryl, threonyl and aminobutyryl;

- e) a peptide which includes only four amino acids of general formula $R_1-AA_1-AA_2-AA_3-AA_4-R_2$, wherein: AA_1 is $-Arg-$; AA_2 is selected from $-His-$ and $-Asn-$; AA_3 is selected from $-His-$ and $-Arg-$; AA_4 is $-Cit-$, Specific examples include $R_1-Arg-His-His-Cit-R_2$, $R_1-Arg-Asn-Arg-Cit-R_2$;

- f) .a peptide which includes only four amino acids of general formula,



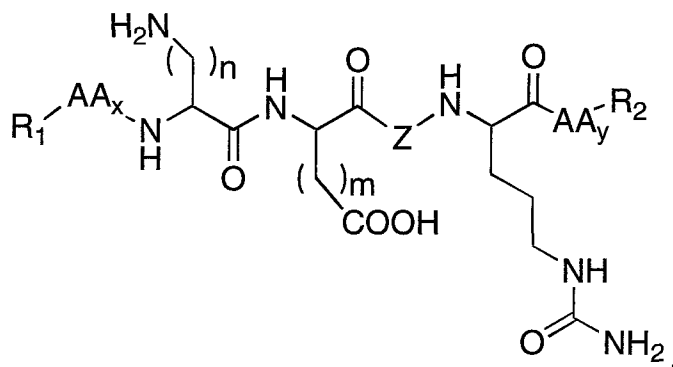
and cosmetically or dermopharmaceutically acceptable salts thereof,

- 5 wherein: X and Y are selected from natural amino acids in their L- or D-form and non-encoded amino acids;
- g) a peptide of only four amino acids of general formula $R_1-AA_1-AA_2-AA_3-AA_4-R_2$, wherein AA_1 is selected from -Lys-, -Orn-, -Dab-, -Dpr-, -Agl-, -3,4-dehydrolysine and -4,5-dehydrolysine; AA_2 is -Ala-; AA_3 is selected from -Asp-, -Ala-, -Asn-, -Glu- and -Pro-; and AA_4 is -His-;
- 10 h) a peptide having a maximum of seven amino acids of general formula $R_1-W_p-X_n-AA_1-AA_2-AA_3-AA_4-Y_m-R_2$, wherein at least one of the amino acids AA_1 , AA_2 and AA_4 is uncoded; AA_1 is selected from -Arg-, -Phg- and -Nle- or is absent; AA_2 is selected from -Ala-, -Phg-, -Cit- and -Nle-; AA_3 is selected from -Trp-, -Val- and -Tyr-; AA_4 is selected from -Phg- and -Gly-; W, X and Y are independently selected from the group consisting of coded and uncoded amino acids; and p, n and m each range between 0 and 1;
- 15 i) a peptide having only three amino acids of general formula $R_1-AA_1-AA_2-AA_3-R_2$, wherein: AA_1 and AA_2 are independently selected from -Tyr- and -Phe-; and AA_3 is selected from -Nle- and -Met-;
- 20 j) a peptide of general formula $R_1-W_n-X_m-AA_1-AA_2-AA_3-AA_4-AA_5-AA_6-Y_p-Z_s-R_2$, wherein AA_1 is selected from -Asp-, -Glu- and -Pro-; AA_2 is -Asp-; AA_3 is selected from -Tyr- and -Arg-; AA_4 is selected from -Phe- and -Tyr-; AA_5 is selected from -Arg- and -Lys-; AA_6 is selected from -Leu- and -Met-; W, X, Y and Z are independently selected from coded
- 25

amino acids and non-coded amino acids; and n, m, p and s independently have a value of between 0 and 1;

- k) a peptide of general formula $R_1-W_n-X_m-AA_1-AA_2-AA_3-AA_4-Y_p-Z_q-R_2$, wherein: AA_1 is $-His-$; AA_2 is selected from the group consisting of $-His-$, $-Leu-$ and $-Pro-$; AA_3 is $-Leu-$; AA_4 is selected from the group consisting of $-Arg-$ and $-Asn-$; W, X, Y and Z are independently selected from the group consisting of codified amino acids and uncoded amino acids; n, m, p and q each have a value between 0 and 1; $n+m+p+q$ is less than or equal to 2;

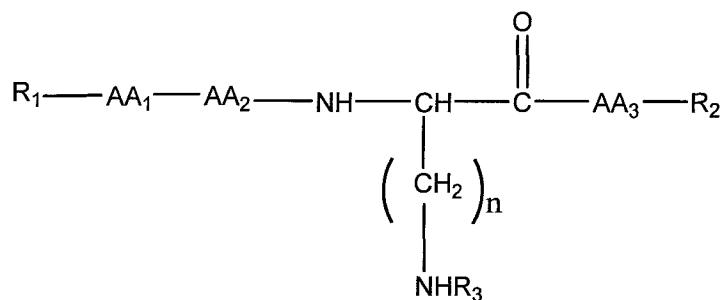
- l) a peptide of general formula:



wherein: Z is selected from the group consisting of alanyl, allo-isoleucyl, glycyl, isoleucyl, isoseryl, isovalyl, leucyl, norleucyl, norvalyl, prolyl, seryl, threonyl, allo-threonyl and valyl; n and m are independently from 1 to 5; AA is selected from the group consisting of natural encoded amino acids in their L- or D-form and non-encoded amino acids; x and y are independently from 0 to 2;

- m) a peptide of general formula: $R_1-W_n-X_m-AA_1-AA_2-AA_3-AA_4-AA_5-AA_6-Y_p-Z_q-R_2$, wherein: AA_1 is selected from $-Ser-$, $-Thr-$ and $-Tyr-$; AA_2 is selected from $-Pro-$ and $-Val-$; AA_3 is $-Ala-$; AA_4 is selected from $-Glu-$, $-Gly-$ and $-Val-$; AA_5 is $-Gly-$; AA_6 is selected from $-Gln-$, $-Gly-$, $-His-$ and $-Pro-$; W, X, Y, Z are independently amino acids; n, m, p and q are independently selected from 0 and 1; $n+m+p+q$ is less than or equal to 2;
- n) a peptide of general formula: $R_1-AA_1-AA_2-AA_3-R_2$, where AA_1 is selected from $-Tyr-$ and $-Phe-$, AA_2 is $-Tyr-$, and AA_3 is selected from $-Nle-$ and $-Met-$;

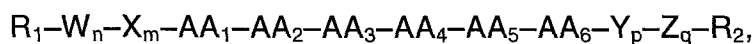
o) a compound of general formula:



,

wherein AA₁ is selected from –Asp–, –Glu–, –Asn–, –Gln–, –Lys– and –Gly–, AA₂ is selected from –Val–, –Leu–, –Ile–, –Met–, –Cit–, –His–, –Thr– and –Gln–; AA₃ is selected from –Tyr–, –Trp– and –4-Abz–; n is selected from 1, 2, 3 and 4, R₃ is selected from H and –AA₂–AA₁–R₁, R₁ is selected from H, a polymer derived from polyethylene glycol, substituted or unsubstituted non-cyclic aliphatic groups, substituted or unsubstituted alicyclyl groups, substituted or unsubstituted heterocyclyl groups, substituted or unsubstituted heteroarylalkyl groups, substituted or unsubstituted aryl groups, substituted or unsubstituted aralkyl groups and R₆–CO–, wherein R₆ is selected from H, substituted or unsubstituted non-cyclic aliphatic groups, substituted or unsubstituted alicyclyl groups, substituted or unsubstituted aryl groups, substituted or unsubstituted aralkyl groups, substituted or unsubstituted heterocyclyl groups and substituted or unsubstituted heteroarylalkyl groups; R₂ is selected from –NR₄R₅, –OR₄ and –SR₄, wherein R₄ and R₅ are independently selected from H, a polymer derived from polyethylene glycol, substituted or unsubstituted non-cyclic aliphatic group, substituted or unsubstituted alicyclyl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted heteroarylalkyl, substituted or unsubstituted aryl, and substituted or unsubstituted aralkyl; and R₁ and/or R₂ are not α-amino acids;

p) a compound of general formula:



wherein AA₁ is –Tyr–; AA₂ is selected from –Asn–, –His–, –Tyr– and –Glu–; AA₃ is selected from –Lys–, –Ser– and –Pro–; AA₄ is selected from

–Gly–, –Leu–, –Lys– and –His–; AA₅ is selected from –Gln– and –Asn–; AA₆ is –Val–; W, X, Y, Z are independently selected from amino acids. n, m, p and q independently have a value of 0 or 1; and n+m+p+q is smaller than or equal to 2; and

5 stereoisomers, mixtures thereof, and cosmetically and dermopharmaceutically acceptable salts thereof, wherein R₁ and R₁ are peptide terminating groups.

62. The polymer film of any one of claims 1–61, wherein the at least one active agent includes a humectant, substance that retains moisture, moisturizer, or emollient
10 selected from the group consisting of Pseudoalteromonas ferment extract, acetyl dipeptide-3 aminohexanoate, glycerin, and mixtures thereof.

63. The polymer film of any one of claims 50–62, wherein the active agent is homogeneously dispersed in the film.

64. The polymer film of any one of claims 1–63, wherein the film is a
15 monolayer.

65. The polymer film of any one of claims 1–64, wherein the film absorbs at least 300 wt. % water when soaked in an aqueous formulation comprising at least 50 wt. % water for 30 minutes at room temperature and retains its integrity.

66. The polymer film of any one of claims 1–65, wherein the film absorbs at
20 least 500 wt. % water when soaked in an aqueous formulation comprising at least 50 wt. % water for 30 minutes at room temperature and retains its integrity.

67. A hydrated film formed from the polymer film of any one of claims 1–66, wherein the hydrated film comprises at least 30 wt. % water.

68. The hydrated film of claim 67, further comprising at least one excipient.

69. The hydrated film of any one of claims 67–68, wherein the at least one excipient is selected from the group consisting of emulsifiers, organic solvents, surfactants, liquid propellants, binders and thickeners, fillers, lubricants, glidants, pigments, dyes, perfumes, flavoring agents, preservatives, and combinations thereof.

5 70. A face mask comprising the polymer film of any one of claims 1–69.

71. The face mask of claim 70, wherein the film is supported on a release layer.

72. The face mask of any one of claims 70–71, wherein the face mask defines apertures to align with at least one of the eyes, nose and mouth of a wearer.

10 73. The face mask of any one of claims 70–72, comprising:
up to 20 wt. % of the polymer film of any one of claims 1–60;
at least one active agent at a total concentration of at least 0.00001 wt. %, and
at least 30 wt. % water.

74. The use of the polymer film of any one of claims 1–69 as a face mask.

15 75. A method of forming a face mask or transdermal patch comprising:
forming a thermoplastic polyurethane polymer from:
 a first polyether polyol having a molecular weight of at least 3000
daltons,
 optionally, a second polyether polyol having a molecular weight of
no more than 2500 daltons, and
20 at least one of a third polyol having a molecular weight of up to 800
daltons and a chain extender;
 casting the thermoplastic polyurethane polymer with an active agent in solution to
form a cast film which includes the active agent dispersed in the thermoplastic
polyurethane polymer.

25 76. A face mask or transdermal patch comprising:

a hydrated film comprising at least 50 wt. % water, 5 to 30 wt. % of a thermoplastic polyurethane polymer, and at least one active agent.