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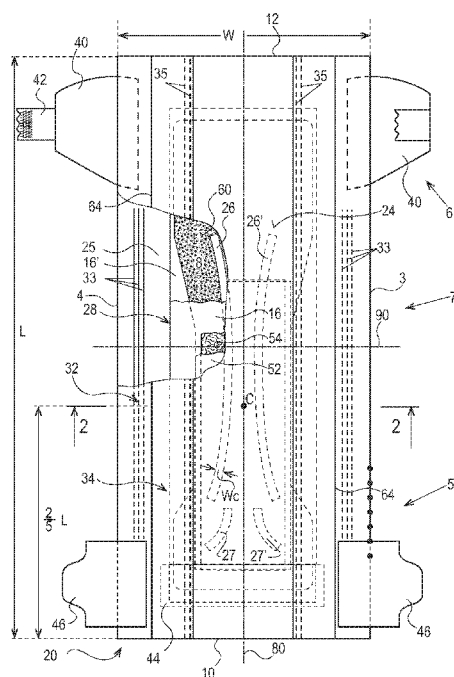


Fig. 1

(57) Abstract: An absorbent article comprising a composition, said com-
position comprising a metathesized unsaturated polyol ester, said metathe-
sized unsaturated polyol ester having one or more of the following prop-
erties: (i) a weight average molecular weight of from about 5,000 Daltons
to about 50,000 Daltons; (ii) an oligomer index from greater than 0 to 1;
(iii) an iodine value of from about 30 to about 200.

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ABSORBENT ARTICLES COMPRISING METATHESIZED UNSATURATED POLYOL ESTERS

FIELD OF THE INVENTION

5 The present invention relates to absorbent articles as well as methods of using same.

BACKGROUND OF THE INVENTION

10 Absorbent articles for personal hygiene, such as disposable diapers for infants, training pants for toddlers, adult incontinence undergarments, and/or sanitary napkins are designed to absorb and contain bodily exudates, in particular large quantities of urine, runny BM, and/or menses (together the “fluids”). These absorbent articles may comprise several layers providing different functions, for example, a topsheet, a backsheet, and an absorbent core disposed between the topsheet and the backsheet, among other layers, if desired. Ideally, the parts of the article that can be felt by the consumer and/or the wearer connote softness. These parts include the topsheet, backsheet, barrier
15 cuffs, waist band, and/or wings. There is a continuing need for articles with improved softness that can benefit contact with the wearer’s skin. Applicants recognize that metathesized unsaturated polyol esters can serve as such a softening active.

20 While not being bound by theory, Applicants believe that the uncharged nature and/or the low degree of oligomerization of the disclosed metathesized unsaturated polyol esters result in the desired improved softness.

SUMMARY OF THE INVENTION

 An absorbent article comprising a composition, said composition comprising a metathesized unsaturated polyol ester, said metathesized unsaturated polyol ester having one or more of the following properties: (i) a weight average molecular weight of from about 5,000 Daltons to about 50,000 Daltons; (ii) an oligomer index from greater than 0 to 1; (iii) an iodine value of from about 30 to about 200.

BRIEF DESCRIPTION OF THE DRAWINGS

25 The above-mentioned and other features and advantages of the present disclosure, and the manner of attaining them, will become more apparent and the disclosure itself will be better

understood by reference to the following description of non-limiting forms of the disclosure taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a top view of an absorbent article, wearer-facing surface facing the viewer, with some layers partially removed in accordance with the present disclosure;

5 Fig. 2 is a cross-sectional view of the absorbent article taken about line 2—2 of Fig. 1 in accordance with the present disclosure;

Fig. 3 is a top view of an absorbent article, wearer-facing surface facing the viewer, that is a sanitary napkin with some of the layers cut away in accordance with the present disclosure.

10 DETAILED DESCRIPTION OF THE INVENTION

Definitions

The terms "natural oils," "natural feedstocks," or "natural oil feedstocks" may refer to oils derived from plants or animal sources. The term "natural oil" includes natural oil derivatives, unless otherwise indicated. The terms also include modified plant or animal sources (e.g., genetically
15 modified plant or animal sources), unless indicated otherwise. Examples of natural oils include, but are not limited to, vegetable oils, algae oils, fish oils, animal fats, tall oils, derivatives of these oils, combinations of any of these oils, and the like. Representative non-limiting examples of vegetable oils include canola oil, rapeseed oil, coconut oil, corn oil, cottonseed oil, olive oil, palm oil, peanut oil, safflower oil, sesame oil, soybean oil, sunflower oil, linseed oil, palm kernel oil, tung oil,
20 jatropha oil, mustard oil, pennycress oil, camelina oil, and castor oil. Representative non-limiting examples of animal fats include lard, tallow, poultry fat, yellow grease, and fish oil. Tall oils are by-products of wood pulp manufacture.

The term "natural oil derivatives" refers to derivatives thereof derived from natural oil. The methods used to form these natural oil derivatives may include one or more of addition,
25 neutralization, overbasing, saponification, transesterification, esterification, amidification, hydrogenation, isomerization, oxidation, alkylation, acylation, sulfurization, sulfonation, rearrangement, reduction, fermentation, pyrolysis, hydrolysis, liquefaction, anaerobic digestion, hydrothermal processing, gasification or a combination of two or more thereof. Examples of natural derivatives thereof may include carboxylic acids, gums, phospholipids, soapstock, acidulated
30 soapstock, distillate or distillate sludge, fatty acids, fatty acid esters, as well as hydroxy substituted variations thereof, including unsaturated polyol esters. In some embodiments, the natural oil derivative may comprise an unsaturated carboxylic acid having from about 5 to about 30 carbon

atoms, having one or more carbon-carbon double bonds in the hydrocarbon (alkene) chain. The natural oil derivative may also comprise an unsaturated fatty acid alkyl (e.g., methyl) ester derived from a glyceride of natural oil. For example, the natural oil derivative may be a fatty acid methyl ester ("FAME") derived from the glyceride of the natural oil. In some embodiments, a feedstock
5 includes canola or soybean oil, as a non-limiting example, refined, bleached, and deodorized soybean oil (i.e., RBD soybean oil).

The term "free hydrocarbon" refers to any one or combination of unsaturated or saturated straight, branched, or cyclic hydrocarbons in the C₂ to C₂₂ range.

The term "metathesis monomer" refers to a single entity that is the product of a metathesis
10 reaction which comprises a molecule of a compound with one or more carbon-carbon double bonds which has undergone an alkylidene unit interchange via one or more of the carbon-carbon double bonds either within the same molecule (intramolecular metathesis) and/or with a molecule of another compound containing one or more carbon-carbon double bonds such as an olefin (intermolecular metathesis).

15 The term "metathesis dimer" refers to the product of a metathesis reaction wherein two reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the metathesis reaction.

The term "metathesis trimer" refers to the product of one or more metathesis reactions
20 wherein three molecules of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the trimer containing three bonded groups derived from the reactant compounds.

25 The term "metathesis tetramer" refers to the product of one or more metathesis reactions wherein four molecules of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the tetramer containing four bonded groups derived from the reactant
30 compounds.

The term "metathesis pentamer" refers to the product of one or more metathesis reactions wherein five molecules of two or more reactant compounds, which can be the same or different and

each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the pentamer containing five bonded groups derived from the reactant compounds.

5 The term "metathesis hexamer" refers to the product of one or more metathesis reactions wherein six molecules of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the hexamer containing six bonded groups derived from the reactant
10 compounds.

 The term "metathesis heptamer" refers to the product of one or more metathesis reactions wherein seven molecules of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more
15 metathesis reactions, the heptamer containing seven bonded groups derived from the reactant compounds.

 The term "metathesis octamer" refers to the product of one or more metathesis reactions wherein eight molecules of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the
20 carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the octamer containing eight bonded groups derived from the reactant compounds.

 The term "metathesis nonamer" refers to the product of one or more metathesis reactions wherein nine molecules of two or more reactant compounds, which can be the same or different and
25 each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the nonamer containing nine bonded groups derived from the reactant compounds.

 The term "metathesis decamer" refers to the product of one or more metathesis reactions
30 wherein ten molecules of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more

metathesis reactions, the decamer containing ten bonded groups derived from the reactant compounds.

The term "metathesis oligomer" refers to the product of one or more metathesis reactions wherein two or more molecules (e.g., 2 to about 10, or 2 to about 4) of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the oligomer containing a few (e.g., 2 to about 10, or 2 to about 4) bonded groups derived from the reactant compounds. In some embodiments, the term "metathesis oligomer" may include metathesis reactions wherein greater than ten molecules of two or more reactant compounds, which can be the same or different and each with one or more carbon-carbon double bonds, are bonded together via one or more of the carbon-carbon double bonds in each of the reactant compounds as a result of the one or more metathesis reactions, the oligomer containing greater than ten bonded groups derived from the reactant compounds.

As used herein, the terms "metathesize" and "metathesizing" may refer to the reacting of a unsaturated polyol ester feedstock in the presence of a metathesis catalyst to form a metathesized unsaturated polyol ester product comprising a new olefinic compound and/ or esters. Metathesizing may refer to cross-metathesis (a.k.a. co-metathesis), self-metathesis, ring-opening metathesis, ring-opening metathesis polymerizations ("ROMP"), ring-closing metathesis ("RCM"), and acyclic diene metathesis ("ADMET"). As a non-limiting example, metathesizing may refer to reacting two triglycerides present in a natural feedstock (self-metathesis) in the presence of a metathesis catalyst, wherein each triglyceride has an unsaturated carbon-carbon double bond, thereby forming an oligomer having a new mixture of olefins and esters that may comprise one or more of: metathesis monomers, metathesis dimers, metathesis trimers, metathesis tetramers, metathesis pentamers, and higher order metathesis oligomers (e.g., metathesis hexamers, metathesis, metathesis heptamers, metathesis octamers, metathesis nonamers, metathesis decamers, and higher than metathesis decamers and above).

As used herein, the term "polyol" means an organic material comprising at least two hydroxy moieties.

As used herein, the term "absorbent article" refers to disposable devices such as infant, child, or adult diapers, adult incontinence products, training pants, sanitary napkins, and the like which are

placed against or in proximity to a body of a wearer to absorb and contain the various fluids (urine, menses, and/or runny BM) or bodily exudates (generally solid BM) discharged from the body.

As used herein, the term “nonwoven web” means a manufactured sheet, web, or batt of directionally or randomly orientated fibers, bonded by friction, and/or cohesion, and/or adhesion, excluding paper and products which are woven, knitted, tufted, stitch-bonded incorporating binding yarns or filaments, or felted by wet-milling, whether or not additionally needed. The fibers may be of natural or man-made origin and may be staple or continuous filaments or be formed in situ. Commercially available fibers may have diameters ranging from less than about 0.001 mm to more than about 0.2 mm and may come in several different forms such as short fibers (known as staple, or chopped), continuous single fibers (filaments or monofilaments), untwisted bundles of continuous filaments (tow), and twisted bundles of continuous filaments (yam). Nonwoven webs may be formed by many processes such as meltblowing, spunbonding, solvent spinning, electrospinning, carding, and airlaying. The basis weight of nonwoven webs is usually expressed in grams per square meter (g/m^2 or gsm).

As used herein, the terms “joined”, “bonded”, or “attached” encompasses configurations whereby an element is directly secured to another element by affixing the element directly to the other element, and configurations whereby an element is indirectly secured to another element by affixing the element to intermediate member(s) which in turn are affixed to the other element.

As used herein, the term “machine direction” or “MD” is the direction that is substantially parallel to the direction of travel of a substrate as it is made. The “cross direction” or “CD” is the direction substantially perpendicular to the MD and in the plane generally defined by the substrate.

As used herein, the articles including “a” and “an” when used in a claim, are understood to mean one or more of what is claimed or described.

As used herein, the terms “include”, “includes” and “including” are meant to be non-limiting.

Unless otherwise noted, all component or composition levels are in reference to the active portion of that component or composition, and are exclusive of impurities, for example, residual solvents or by-products, which may be present in commercially available sources of such components or compositions.

All percentages and ratios are calculated by weight unless otherwise indicated. All percentages and ratios are calculated based on the total composition unless otherwise indicated.

It should be understood that every maximum numerical limitation given throughout this specification includes every lower numerical limitation, as if such lower numerical limitations were

expressly written herein. Every minimum numerical limitation given throughout this specification will include every higher numerical limitation, as if such higher numerical limitations were expressly written herein. Every numerical range given throughout this specification will include every narrower numerical range that falls within such broader numerical range, as if such narrower numerical ranges were all expressly written herein.

Absorbent Article

An example absorbent article in the form of a diaper 20 is represented in Figs. 1-3. Fig. 1 is a plan view of the example diaper 20, in a flat-out state, with portions of the structure being cut-away to more clearly show the construction of the diaper 20. The wearer-facing surface of the diaper 20 of Fig. 1 is facing the viewer. This diaper 20 is shown for illustration purpose only as the three-dimensional substrates of the present disclosure may be used as one or more components of an absorbent article.

The absorbent article 20 may comprise a liquid permeable topsheet 24, a liquid impermeable backsheet 25, an absorbent core 28 positioned at least partially intermediate the topsheet 24 and the backsheet 25, and barrier leg cuffs 34. The absorbent article may also comprise an acquisition and/or distribution system ("ADS") 50, which in the example represented comprises a distribution layer 54 and an acquisition layer 52, which will be further detailed below. The absorbent article may also comprise elasticized gasketing cuffs 32 comprising elastics 33 joined to a chassis of the absorbent article, typically via the topsheet and/or backsheet, and substantially planar with the chassis of the diaper.

The figures also show typical taped diaper components such as a fastening system comprising tabs 42 attached towards the rear edge of the article and cooperating with a landing zone 44 on the front of the absorbent article. The absorbent article may also comprise other typical elements, which are not represented, such as a rear elastic waist feature, a front elastic waist feature, transverse barrier cuff(s), and/or a lotion application, for example.

The absorbent article 20 comprises a front waist edge 10, a rear waist edge 12 longitudinally opposing the front waist edge 10, a first side edge 3, and a second side edge 4 laterally opposing the first side edge 3. The front waist edge 10 is the edge of the article which is intended to be placed towards the front of the user when worn, and the rear waist edge 12 is the opposite edge. The absorbent article may have a longitudinal axis 80 extending from the lateral midpoint of the front waist edge 10 to a lateral midpoint of the rear waist edge 12 of the article and dividing the article in

two substantially symmetrical halves relative to the longitudinal axis 80, with the article placed flat and viewed from above as in Fig. 1. The absorbent article may also have a lateral axis 90 extending from the longitudinal midpoint of the first side edge 3 to the longitudinal midpoint of the second side edge 4. The length, L, of the article may be measured along the longitudinal axis 80 from the front waist edge 10 to the rear waist edge 12. The width, W, of the article may be measured along the lateral axis 90 from the first side edge 3 to the second side edge 4. The article may comprise a crotch point C defined herein as the point placed on the longitudinal axis at a distance of two fifth (2/5) of L starting from the front edge 10 of the article 20. The article may comprise a front waist region 5, a rear waist region 6, and a crotch region 7. The front waist region 5, the rear waist region 6, and the crotch region 7 each define 1/3 of the longitudinal length, L, of the absorbent article.

The topsheet 24, the backsheet 25, the absorbent core 28, and the other article components may be assembled in a variety of configurations, in particular by gluing or heat embossing, for example. Example absorbent article configurations are described generally in U.S. Pat. No. 3,860,003, U.S. Pat. No. 5,221,274, U.S. Pat. No. 5,554,145, U.S. Pat. No. 5,569,234, U.S. Pat. No. 5,580,411, and U.S. Pat. No. 6,004,306.

The absorbent core 28 may comprise an absorbent material comprising at least 80% by weight, at least 90% by weight, at least 95% by weight, or at least 99% by weight of superabsorbent polymers and a core wrap enclosing the superabsorbent polymers. The core wrap may typically comprise two materials, substrates, or nonwoven materials 16 and 16' for the top side and bottom side of the core. The core may comprises one or more channels, represented in Fig. 1 as the four channels 26, 26' and 27, 27'. The channels 26, 26', 27, and 27' are optional features. Instead, the core may not have any channels or may have any number of channels.

These and other components of the example absorbent article will now be discussed in more details.

Topsheet

The topsheet 24 may be the part of the absorbent article that is in contact with the wearer's skin. The topsheet 24 may be joined to the backsheet 25, the core 28 and/or any other layers as is known to those of skill in the art. Usually, the topsheet 24 and the backsheet 25 are joined directly to each other in some locations (e.g., on or close to the periphery of the absorbent article) and are indirectly joined together in other locations by directly joining them to one or more other elements of the article 20.

The topsheet 24 may be compliant, soft-feeling, and non-irritating to the wearer's skin. Further, a portion of, or all of, the topsheet 24 may be liquid permeable, permitting liquids to readily penetrate through its thickness. A suitable topsheet may be manufactured from a wide range of materials, such as porous foams, reticulated foams, apertured plastic films, or woven or nonwoven materials of natural fibers (e.g., wood or cotton fibers), synthetic fibers or filaments (e.g., polyester or polypropylene or bicomponent PE/PP fibers or mixtures thereof), or a combination of natural and synthetic fibers. If the topsheet 24 includes fibers, the fibers may be spunbond, carded, wet-laid, meltblown, hydroentangled, or otherwise processed as is known in the art. A suitable topsheet comprising a web of staple-length polypropylene fibers is manufactured by Veratec, Inc., a Division of International Paper Company, of Walpole, MA under the designation P-8.

Any portion of the topsheet 24 may be coated with a lotion and/or a skin care composition as is generally disclosed in the art. The topsheet 24 may also comprise or be treated with antibacterial agents, some examples of which are disclosed in PCT Publication WO95/24173. Further, the topsheet 24, the backsheet 25 or any portion of the topsheet or backsheet may be embossed and/or matte finished to provide a more cloth like appearance.

The topsheet 24 may comprise one or more apertures to ease penetration of fluids therethrough. The size of at least the primary apertures is important in achieving the desired fluid encapsulation performance. If the primary apertures are too small, the fluids may not pass through the apertures, either due to poor alignment of the fluid source and the aperture location or due to runny fecal masses, for example, having a diameter greater than the apertures. If the apertures are too large, the area of skin that may be contaminated by "rewet" from the article is increased. Typically, the total area of the apertures at the surface of a diaper may have an area of between about 10 cm² and about 50 cm² or between about 15 cm² and 35 cm². Examples of apertured topsheets are disclosed in U.S. Pat. No. 6632504, assigned to BBA NONWOVENS SIMPSONVILLE. Typical diaper topsheets have a basis weight of from about 10 to about 25gsm or from about 12 to about 20 gsm, but other basis weights are within the scope of the present disclosure.

Backsheet

The backsheet 25 is generally that portion of the absorbent article 20 positioned adjacent the garment-facing surface of the absorbent core 28 and which prevents, or at least inhibits, the fluids and bodily exudates absorbed and contained therein from soiling articles such as bedsheets and undergarments. The backsheet 25 is typically impermeable, or at least substantially impermeable, to fluids (e.g., urine). The backsheet may, for example, be or comprise a thin plastic film such as a

thermoplastic film having a thickness of about 0.012 mm to about 0.051 mm. Example backsheet films include those manufactured by Tredegar Corporation, based in Richmond, VA, and sold under the trade name CPC2 film. Other suitable backsheet materials may include breathable materials which permit vapors to escape from the absorbent article 20 while still preventing, or at least
5 inhibiting, fluids from passing through the backsheet 25. Example breathable materials may include materials such as woven webs, nonwoven webs, composite materials such as film-coated nonwoven webs, microporous films such as manufactured by Mitsui Toatsu Co., of Japan under the designation ESPOIR NO and by Tredegar Corporation of Richmond, VA, and sold under the designation EXAIRE, and monolithic films such as manufactured by Clopay Corporation, Cincinnati, OH under
10 the name HYTREL blend P18-3097.

Any portion of the backsheet 25 may be coated with a lotion and/or a skin care composition as is generally disclosed in the art. The backsheet 25 may be joined to the topsheet 24, the absorbent core 28, and/or any other element of the absorbent article 20 by any attachment methods known to those of skill in the art. Suitable attachment methods are described above with respect to methods for
15 joining the topsheet 24 to other elements of the article 20.

An outer cover 23 may cover at least a portion of, or all of, the backsheet 25 to form a soft garment-facing surface of the absorbent article. The outer cover 23 may be formed of one or more nonwoven materials. The outer cover 23 is illustrated in dash in Fig. 2, as an example. The outer cover 23 may be joined to at least a portion of the backsheet 25 through mechanical bonding,
20 adhesive bonding, or other suitable methods of attachment.

Absorbent Core

As used herein, the term “absorbent core” refers to the component of the absorbent article having the most absorbent capacity and comprising an absorbent material and a core wrap or core
25 bag enclosing the absorbent material. The term “absorbent core” does not include the acquisition and/or distribution system or any other components of the article which are not either integral part of the core wrap or core bag or placed within the core wrap or core bag. The absorbent core may comprise, consist essentially of, or consist of, a core wrap, an absorbent material (e.g., superabsorbent polymers) as discussed, and glue.

The absorbent core 28 may comprise an absorbent material with a high amount of superabsorbent polymers (herein abbreviated as “SAP”) enclosed within the core wrap. The SAP content may represent 70%-100% or at least 70%, 75%, 80%, 85%, 90%, 95%, 99%, or 100%, by weight of the
30

absorbent material, contained in the core wrap. The core wrap is not considered as absorbent material for the purpose of assessing the percentage of SAP in the absorbent core. The core may also contain airfelt or cellulosic fibers with or without SAP.

By "absorbent material" it is meant a material which has some absorbency property or liquid retaining properties, such as SAP, cellulosic fibers as well as synthetic fibers. Typically, glues used in making absorbent cores have no or little absorbency properties and are not considered as absorbent material. The SAP content may be higher than 80%, for example at least 85%, at least 90%, at least 95%, at least 99%, and even up to and including 100% of the weight of the absorbent material contained within the core wrap. This provides a relatively thin core compared to a conventional core typically comprising between 40-60% SAP and high content of cellulose fibers. The conventional cores are also within the scope of the present disclosure. The absorbent material may in particular comprises less than 15% weight percent or less than 10% weight percent of natural, cellulosic, or synthetic fibers, less than 5% weight percent, less than 3% weight percent, less than 2% weight percent, less than 1% weight percent, or may even be substantially free of natural, cellulosic, and/or synthetic fibers.

Superabsorbent Polymer (SAP)

"Superabsorbent polymers" ("SAP"), as used herein, refer to absorbent materials which are cross-linked polymeric materials that can absorb at least 10 times their weight of an aqueous 0.9% saline solution as measured using the Centrifuge Retention Capacity (CRC) test (EDANA method WSP 241.2-05E). The SAP used may have a CRC value of more than 20 g/g, more than 24 g/g, from 20 to 50 g/g, from 20 to 40 g/g, or from 24 to 30 g/g, specifically reciting all 0.1 g/g increments within the above-specified ranges and any ranges created therein or thereby. The SAP useful with the present disclosure may include a variety of water-insoluble, but water-swellaable polymers capable of absorbing large quantities of fluids.

The superabsorbent polymer may be in particulate form so as to be flowable in the dry state. Particulate absorbent polymer materials may be made of poly(meth)acrylic acid polymers. However, starch-based particulate absorbent polymer material may also be used, as well as polyacrylamide copolymer, ethylene maleic anhydride copolymer, cross-linked carboxymethylcellulose, polyvinyl alcohol copolymers, cross-linked polyethylene oxide, and starch grafted copolymer of polyacrylonitrile.

The SAP may be of numerous shapes. The term “particles” refers to granules, fibers, flakes, spheres, powders, platelets and other shapes and forms known to persons skilled in the art of superabsorbent polymer particles. The SAP particles may be in the shape of fibers, i.e., elongated, acicular superabsorbent polymer particles. The fibers may also be in the form of a long filament that may be woven. SAP may be spherical-like particles. The absorbent core may comprise one or more types of SAP.

For most absorbent articles, liquid discharges from a wearer occur predominately in the front half of the absorbent article, in particular for a diaper. The front half of the article (as defined by the region between the front edge and a transversal line placed at a distance of half L from the front waist edge 10 or rear waist edge 12 may therefore may comprise most of the absorbent capacity of the core. Thus, at least 60% of the SAP, or at least 65%, 70%, 75%, 80%, or 85% of the SAP may be present in the front half of the absorbent article, while the remaining SAP may be disposed in the rear half of the absorbent article. Alternatively, the SAP distribution may be uniform through the core or may have other suitable distributions.

The total amount of SAP present in the absorbent core may also vary according to expected user. Diapers for newborns may require less SAP than infant, child, or adult incontinence diapers. The amount of SAP in the core may be about 5 to 60 g or from 5 to 50 g, specifically reciting all 0.1 increments within the specified ranges and any ranged formed therein or thereby. The average SAP basis weight within the (or “at least one”, if several are present) deposition area 8 of the SAP may be at least 50, 100, 200, 300, 400, 500 or more g/m². The areas of the channels (e.g., 26, 26', 27, 27') present in the absorbent material deposition area 8 are deduced from the absorbent material deposition area to calculate this average basis weight.

Core Wrap

The core wrap may be made of a single substrate, material, or nonwoven folded around the absorbent material, or may comprise two (or more) substrates, materials, or nonwovens which are attached to another. Typical attachments are the so-called C-wrap and/or sandwich wrap. The core wrap may be formed by any materials suitable for receiving and containing the absorbent material. Typical substrate materials used in the production of conventional cores may be used, in particular paper, tissues, films, wovens or nonwovens, or laminates or composites of any of these.

If the core wrap is formed by two substrates 16, 16', four seals may be used to enclose the absorbent material 60 within the core wrap. For example, a first substrate 16 may be placed on one

side of the core (the top side as represented in the Figures) and extend around the core's longitudinal edges to at least partially wrap the opposed bottom side of the core. The second substrate 16' may be present between the wrapped flaps of the first substrate 16 and the absorbent material 60. The flaps of the first substrate 16 may be glued to the second substrate 16' to provide a strong seal. This so called C-wrap construction may provide benefits such as improved resistance to bursting in a wet loaded state compared to a sandwich seal. The front side and rear side of the core wrap may then also be sealed by gluing the first substrate and second substrate to another to provide complete encapsulation of the absorbent material across the whole of the periphery of the core. For the front side and rear side of the core, the first and second substrates may extend and may be joined together in a substantially planar direction, forming for these edges a so-called sandwich construction. In the so-called sandwich construction, the first and second substrates may also extend outwardly on all sides of the core and be sealed flat, or substantially flat, along the whole or parts of the periphery of the core typically by gluing and/or heat/pressure bonding. In an example, neither the first nor the second substrates need to be shaped, so that they may be rectangularly cut for ease of production but other shapes are within the scope of the present disclosure.

The core wrap may also be formed by a single substrate which may enclose as in a parcel wrap the absorbent material and be sealed along the front side and rear side of the core and one longitudinal seal.

SAP Deposition Area

The absorbent material deposition area 8 may be defined by the periphery of the layer formed by the absorbent material 60 within the core wrap, as seen from the top side of the absorbent core. The absorbent material deposition area 8 may have various shapes, in particular, a so-called "dog bone" or "hour-glass" shape, which shows a tapering along its width towards the middle or "crotch" region of the core. In this way, the absorbent material deposition area 8 may have a relatively narrow width in an area of the core intended to be placed in the crotch region of the absorbent article, as illustrated in Fig. 1. This may provide better wearing comfort. The absorbent material deposition area 8 may also be generally rectangular, but other deposition areas, such as a rectangular, "T," "Y," "sand-hour," or "dog-bone" shapes are also within the scope of the present disclosure. The absorbent material may be deposited using any suitable techniques, which may allow relatively precise deposition of SAP at relatively high speed.

Channels

The absorbent material deposition area 8 may comprise at least one channel 26, which is at least partially oriented in the longitudinal direction of the article 80 (i.e., has a longitudinal vector component). Other channels may be at least partially oriented in the lateral direction (i.e., has a lateral vector component) or in any other direction. In the following, the plural form “channels” will be used to mean “at least one channel”. The channels may have a length L' projected on the longitudinal axis 80 of the article that is at least 10% of the length L of the article. The channels may be formed in various ways. For example, the channels may be formed by zones within the absorbent material deposition area 8 which may be substantially free of, or free of, absorbent material, in particular SAP. In addition or alternatively, the channel(s) may also be formed by continuously or discontinuously bonding the top side of the core wrap to the bottom side of the core wrap through the absorbent material deposition area 8. The channels may be continuous but it is also envisioned that the channels may be intermittent. The acquisition-distribution system or layer 50, or another layer of the article, may also comprise channels, which may or not correspond to the channels of the absorbent core.

In some instances, the channels may be present at least at the same longitudinal level as the crotch point C or the lateral axis 60 in the absorbent article, as represented in Fig. 1 with the two longitudinally extending channels 26, 26'. The channels may also extend from the crotch region 7 or may be present in the front waist region 5 and/or in the rear waist region 6 of the article.

The absorbent core 28 may also comprise more than two channels, for example, at least 3, at least 4, at least 5, or at least 6 or more.

In order to reduce the risk of fluid leakages, the longitudinal main channels may not extend up to any of the edges of the absorbent material deposition area 8, and may therefore be fully encompassed within the absorbent material deposition area 8 of the core. The smallest distance between a channel and the closest edge of the absorbent material deposition area 8 may be at least 5 mm.

The channels may have a width W_c along at least part of their length which is at least 2 mm, at least 3 mm, at least 4 mm, up to for example 20 mm, 16 mm, or 12 mm, for example. The width of the channel(s) may be constant through substantially the whole length of the channel or may vary along its length. At least some or all of the channels may be permanent channels, meaning their integrity is at least partially maintained both in the dry state and in the wet state. Permanent channels may be obtained by provision of one or more adhesive materials, for example, the fibrous

layer of adhesive material or construction glue that helps adhere a substrate with an absorbent material within the walls of the channel. Permanent channels may also be formed by bonding the upper side and lower side of the core wrap (e.g., the first substrate 16 and the second substrate 16') and/or the topsheet 24 to the backsheet 25 together through the channels. The channels may advantageously remain or become visible at least through the topsheet and/or backsheet when the absorbent article is fully loaded with a fluid. This may be obtained by making the channels substantially free of SAP, so they will not swell, and sufficiently large so that they will not close when wet. Furthermore, bonding the core wrap to itself or the topsheet to the backsheet through the channels may be advantageous.

Barrier Leg Cuffs

The absorbent article may comprise a pair of barrier leg cuffs 34. Each barrier leg cuff may be formed by a piece of material which is bonded to the article so it may extend upwards from a wearer-facing surface of the absorbent article and provide improved containment of fluids and other body exudates approximately at the junction of the torso and legs of the wearer. The barrier leg cuffs are delimited by a proximal edge 64 joined directly or indirectly to the topsheet 24 and/or the backsheet 25 and a free terminal edge 66, which is intended to contact and form a seal with the wearer's skin. The barrier leg cuffs 34 extend at least partially between the front waist edge 10 and the rear waist edge 12 of the absorbent article on opposite sides of the longitudinal axis 80 and are at least present at the level of the crotch point (C) or crotch region. The barrier leg cuffs may be joined at the proximal edge 64 with the chassis of the article by a bond 65 which may be made by gluing, fusion bonding, or a combination of other suitable bonding processes. The bond 65 at the proximal edge 64 may be continuous or intermittent. The bond 65 closest to the raised section of the leg cuffs delimits the proximal edge 64 of the standing up section of the leg cuffs.

The barrier leg cuffs may be integral with the topsheet 24 or the backsheet 25 or may be a separate material joined to the article's chassis. Each barrier leg cuff 34 may comprise one, two or more elastic strings 35 close to the free terminal edge 66 to provide a better seal.

In addition to the barrier leg cuffs 34, the article may comprise gasketing cuffs 32, which are joined to the chassis of the absorbent article, in particular to the topsheet 24 and/or the backsheet 25 and are placed externally relative to the barrier leg cuffs. The gasketing cuffs 32 may provide a better seal around the thighs of the wearer. Each gasketing leg cuff may comprise one or more elastic strings or elastic elements 33 in the chassis of the absorbent article between the topsheet 24 and backsheet 25

in the area of the leg openings. All, or a portion of, the barrier leg cuffs and/or gasketing cuffs may be treated with a lotion or another skin care composition.

Acquisition-Distribution System

5 The absorbent articles of the present disclosure may comprise an acquisition-distribution layer or system 50 (“ADS”). One function of the ADS is to quickly acquire one or more of the fluids and distribute them to the absorbent core in an efficient manner. The ADS may comprise one, two or more layers, which may form a unitary layer or may remain as discrete layers which may be attached to each other. In an example, the ADS may comprise two layers: a distribution layer 54 and
10 an acquisition layer 52 disposed between the absorbent core and the topsheet, but the present disclosure is not so limited.

 The ADS may comprise SAP as this may slow the acquisition and distribution of the fluids. Suitable ADS are described in WO 2000/59430 (Daley), WO 95/10996 (Richards), U.S. Pat. No. 5,700,254 (McDowall), and WO 02/067809 (Graef), for example.

15 The distribution layer of the ADS may comprise at least 50% by weight of cross-linked cellulose fibers. The cross-linked cellulosic fibers may be crimped, twisted, or curled, or a combination thereof including crimped, twisted, and curled. This type of material is disclosed in U.S. Pat. Publ. No. 2008/0312622 A1 (Hundorf). The cross-linked cellulosic fibers provide higher resilience and therefore higher resistance to the first absorbent layer against the compression in the
20 product packaging or in use conditions, e.g., under wearer weight. This may provide the core with a higher void volume, permeability, and liquid absorption, and hence reduced leakage and improved dryness.

 The distribution layer comprising the cross-linked cellulose fibers of the present disclosure may comprise other fibers, but this layer may advantageously comprise at least 50%, or 60%, or
25 70%, or 80%, or 90%, or even up to 100%, by weight of the layer, of cross-linked cellulose fibers (including the cross-linking agents). Examples of such mixed layer of cross-linked cellulose fibers may comprise about 70% by weight of chemically cross-linked cellulose fibers, about 10 % by weight polyester (PET) fibers, and about 20% by weight untreated pulp fibers. In another example, the layer of cross-linked cellulose fibers may comprise about 70% by weight chemically cross-linked
30 cellulose fibers, about 20% by weight lyocell fibers, and about 10% by weight PET fibers. In still another example, the layer may comprise about 68% by weight chemically cross-linked cellulose fibers, about 16 % by weight untreated pulp fibers, and about 16% by weight PET fibers. In yet

another example, the layer of cross-linked cellulose fibers may comprise from about 90 to about 100% by weight chemically cross-linked cellulose fibers.

The ADS 50 may comprise an acquisition layer 52. The acquisition layer may be disposed between the distribution layer 54 and the topsheet 24. The acquisition layer 52 may be or may
5 comprise a nonwoven material, such as an SMS or SMMS material, comprising a spunbonded, a melt-blown and a further spunbonded layer or alternatively a carded chemical-bonded nonwoven. The nonwoven material may be latex bonded.

A further acquisition layer may be used in addition to a first acquisition layer described above. For example, a tissue layer may be placed between the first acquisition layer and the
10 distribution layer. The tissue may have enhanced capillarity distribution properties compared to the acquisition layer described above.

Fastening System

The absorbent article may include a fastening system. The fastening system may be used to
15 provide lateral tensions about the circumference of the absorbent article to hold the absorbent article on the wearer as is typical for taped diapers. This fastening system may not be necessary for training pant articles since the waist region of these articles is already bonded. The fastening system may comprise a fastener such as tape tabs, hook and loop fastening components, interlocking fasteners such as tabs & slots, buckles, buttons, snaps, and/or hermaphroditic fastening components, although
20 any other suitable fastening mechanisms are also within the scope of the present disclosure. A landing zone 44 is normally provided on the garment-facing surface of the front waist region 5 for the fastener to be releasably attached thereto.

Pants

An alternate configuration for absorbent articles is one for absorbent pants in which the
25 central chassis structure does not extend to, or form, the front and rear waist edges of the pant. Rather, an elasticized belt structure entirely encircles the wearer's waist and forms the waist edge about the entire pant, and the side/hip panels. The central chassis is joined to the belt structure, usually on the inside thereof, with its ends disposed at locations in the front and rear waist regions
30 somewhat below the waist edges of the belt structure. The elastic belt is usually relatively wide (in the longitudinal direction) and elastically stretchable in the lateral direction. It entirely encircles the

wearer's waist, and thereby covers a relatively large amount of the wearer's skin. This configuration is sometimes known as a "belt" or "balloon" configuration (hereinafter, "belt" configuration).

In more detail, an absorbent article may have a front region, a rear region, and a crotch region disposed therebetween, further comprising a liquid permeable topsheet, a backsheet, and an absorbent core disposed between the topsheet and the backsheet. The article then may have a central chassis occupying the crotch region, and a belt structure disposed about the central chassis, the belt structure overlaying the backsheet to the outside thereof in the front and rear regions, and the belt structure overlapping and extending laterally and longitudinally outward from the chassis. The belt structure may comprise an outer nonwoven and an inner nonwoven and have elastic strands therebetween. The belt structure may further have a front belt portion having a front waist edge, and front left and right side edges; and a rear belt portion having a rear waist edge and rear left and right side edges, wherein the respective front and rear left side edges and the respective front and rear right side edges are joined, forming a waist opening and left and right leg openings.

Any pant configuration may have any of the article components described herein, for example, the topsheet, backsheet, core, barrier cuffs, and/or liquid management system layers described herein, along with any of the lotion compositions described herein. Further descriptions and embodiments of pant configurations may be found in U.S. Ser. No. 62/210635.

Front and Rear Ears

The absorbent article may comprise front ears 46 and rear ears 40. The ears may be an integral part of the chassis, such as formed from the topsheet 24 and/or backsheet 26 as side panels. Alternatively, as represented on Fig. 1, the ears may be separate elements attached by gluing, heat embossing, and/or pressure bonding. The rear ears 40 may be stretchable to facilitate the attachment of the tabs 42 to the landing zone 44 and maintain the taped diapers in place around the wearer's waist. The rear ears 40 may also be elastic or extensible to provide a more comfortable and contouring fit by initially conformably fitting the absorbent article to the wearer and sustaining this fit throughout the time of wear well past when absorbent article has been loaded with fluids or other bodily exudates since the elasticized ears allow the sides of the absorbent article to expand and contract.

Elastic Waist Feature

The absorbent article 20 may also comprise at least one elastic waist feature (not represented) that helps to provide improved fit and containment. The elastic waist feature is generally intended to elastically expand and contract to dynamically fit the wearer's waist. The elastic waist feature may extend at least longitudinally outwardly from at least one waist edge of the absorbent core 28 and generally forms at least a portion of the end edge of the absorbent article. Disposable diapers may be constructed so as to have two elastic waist features, one positioned in the front waist region and one positioned in the rear waist region. Any portion of a waist region may be coated with a lotion and/or a skin care composition as is generally disclosed in the art.

Relations Between the Layers

Typically, adjacent layers and components may be joined together using conventional bonding methods, such as adhesive coating via slot coating or spraying on the whole or part of the surface of the layer, thermo-bonding, pressure bonding, or combinations thereof. This bonding is not represented in the Figures (except for the bonding between the raised element of the leg cuffs 65 with the topsheet 24) for clarity and readability, but bonding between the layers of the article should be considered to be present unless specifically excluded. Adhesives may be used to improve the adhesion of the different layers between the backsheet 25 and the core wrap. The glue may be any suitable hotmelt glue known in the art.

Sanitary Napkin

The three-dimensional substrates of the present disclosure may form a portion of a topsheet, form the topsheet, form a portion of, or all of a secondary topsheet, or be positioned on or joined to at least a portion of the topsheet of a sanitary napkin. Referring to Fig. 9, the absorbent article may comprise a sanitary napkin 300. The sanitary napkin 300 may comprise a liquid permeable topsheet 314, a liquid impermeable, or substantially liquid impermeable, backsheet 316, and an absorbent core 308. The absorbent core 308 may have any or all of the features described herein with respect to the absorbent cores 28 and, in some forms, may have a secondary topsheet instead of the acquisition-distribution system disclosed above. The sanitary napkin 300 may also comprise wings 320 extending outwardly with respect to a longitudinal axis 380 of the sanitary napkin 300. Any portion of the wings may be coated with a lotion and/or a skin care composition as is generally disclosed in the art. The sanitary napkin 300 may also comprise a lateral axis 390. The wings 320 may be joined

to the topsheet 314, the backsheet 316, and/or the absorbent core 308. The sanitary napkin 300 may also comprise a front edge 322, a rear edge 324 longitudinally opposing the front edge 322, a first side edge 326, and a second side edge 328 longitudinally opposing the first side edge 326. The longitudinal axis 380 may extend from a midpoint of the front edge 322 to a midpoint of the rear edge 324. The lateral axis 390 may extend from a midpoint of the first side edge 326 to a midpoint of the second side edge 328. The sanitary napkin 300 may also be provided with additional features commonly found in sanitary napkins as is generally known in the art, such as a secondary topsheet 319, for example.

10 Compositions, Articles, Methods of Use and Treated Articles

Metathesized unsaturated polyol esters

Comp. No.	Composition
1	A composition comprising, a) a metathesized unsaturated polyol ester, said metathesized unsaturated polyol ester having one or more of the following properties: (i) a weight average molecular weight of from about 5,000 Daltons to about 50,000 Daltons, from about 5,500 Daltons to about 50,000 Daltons, from about 5,500 Daltons to about 40,000 Daltons, or from about 6,000 Daltons to about 30,000 Daltons; (ii) an oligomer index from greater than 0 to 1, from 0.001 to 1, 0.01 to 1, or from 0.05 to 1; (iii) an iodine value of from about 30 to about 200, from about 30 to about 150, from about 30 to about 120, or from about 50 to about 110; and b) a material selected from the group consisting of emollients, structuring agents, viscosity enhancers, surfactants, skin care ingredients, vitamins, moisturizers, perfumes, aesthetic ingredients, enzyme inhibitors, and combinations thereof.
	In one aspect of said composition 1 of Table 1, said metathesized unsaturated

2	polyol ester has the weight average molecular weight property from a)(i) above.
3	In one aspect of said composition 1 of Table 1, said metathesized unsaturated polyol ester has the oligomer index property from a)(ii) above.
4	In one aspect of said composition 1 of Table 1, said metathesized unsaturated polyol ester has the iodine value property from a)(iii) above.
5	In one aspect of said composition 1 of Table 1, said metathesized unsaturated polyol ester has the property from a)(i) and from a)(ii) above.
6	In one aspect of said composition 1 of Table 1, said metathesized unsaturated polyol ester has the properties from a)(i) and from a)(iii) above.
7	In one aspect of said composition 1 of Table 1, said metathesized unsaturated polyol ester has the properties from a)(ii) and from a)(iii) above.
8	In one aspect of said composition 1 of Table 1, said metathesized unsaturated polyol ester has the properties from a)(i), a)(ii) and from a)(iii) above.
9	In one aspect, of compositions 1, 2, 3, 4, 5, 6, 7, and 8 of Table 1, said metathesized unsaturated polyol ester has a free hydrocarbon content, based on total weight of metathesized unsaturated polyol ester, of from about 0% to about 5%, from about 0.1% to about 5%, from about 0.1% to about 4%, or from about 0.1 to about 3%.
10	In one aspect of Table 1 Compositions 1, 2, 3, 4, 5, 6, 7, 8, and 9 the metathesized unsaturated polyol ester is metathesized at least once.

Table 2 Compositions

Comp. No.	Composition
1	A composition comprising: a) a metathesized unsaturated polyol ester, said metathesized unsaturated polyol ester having a weight average molecular weight of from about 2,000 Daltons to about 50,000 Daltons, from about 2,500 Daltons to about 50,000 Daltons, from about 3,000 Daltons to about 40,000 Daltons, from about 3,000 Daltons

	to about 30,000 Daltons; and one or more of the following properties: (i) a free hydrocarbon content, based on total weight of metathesized unsaturated polyol ester, of from about 0% to about 5%, from about 0.1% to about 5%, from about 0.1% to about 4%, or from about 0.1 to about 3%; (ii) an oligomer index from greater than 0 to 1, from 0.001 to 1, 0.01 to 1, or from 0.05 to 1; (iii) an iodine value of from about 8 to about 200, from about 10 to about 200, from about 20 to about 150, from about 30 to about 120; and b) optionally, a material selected from the group consisting of emollients, structuring agents, viscosity enhancers, surfactants, skin care ingredients, vitamins, moisturizers, perfumes, aesthetic ingredients, enzyme inhibitors, and combinations thereof.
2	In one aspect of said composition 1 of Table 2, said metathesized unsaturated polyol ester has the free hydrocarbon content property from a)(i) above.
3	In one aspect of said composition 1 of Table 2, said metathesized unsaturated polyol ester has the oligomer index property from a)(ii) above.
4	In one aspect of said composition 1 of Table 2, said metathesized unsaturated polyol ester has the iodine value property from a)(iii) above.
5	In one aspect of said composition 1 of Table 2, said metathesized unsaturated polyol ester has the property from a)(i) and from a)(ii) above.
6	In one aspect of said composition 1 of Table 2, said metathesized unsaturated polyol ester has the properties from a)(i) and from a)(iii) above.
7	In one aspect of said composition 1 of Table 2, said metathesized unsaturated polyol ester has the properties from a)(ii) and from a)(iii) above.
8	In one aspect of said composition 1 of Table 2, said metathesized unsaturated polyol ester has the properties from a)(i), a)(ii) and from a)(iii) above.
9	In one aspect of Table 2 Compositions 1, 2, 3, 4, 5, 6, 7, and 8 the metathesized unsaturated polyol ester is metathesized at least once.

In some embodiments, any of the compositions of tables 1 and 2 may be applied to at least one component of the article, wherein said absorbent article components are selected from the group consisting of a topsheet, a secondary topsheet, back sheet, barrier cuff, waist band, wing, and waist feature.

In one aspect, the composition may consist of or consist essentially of the polyol ester. In another aspect, the compositions applied to the absorbent article may further comprise an adjunct ingredient selected from the group consisting of emollients, structuring agents, viscosity enhancers, surfactants, skin care ingredients, vitamins, moisturizers, perfumes, aesthetic ingredients, enzyme inhibitors, and combinations thereof.

Table 1 Compositions 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10; and Table 2 Compositions 1, 2, 3, 4, 5, 6, 7, 8, and 9 may comprise one or more of the following:

- a) from about 1% to about 90%, from about 5% to about 50%, or from about 10% to about 25% of an emollient or emollient system;
- b) from about 1% to about 50%, from about 5% to about 30%, or from about 10% to about 20% of a immobilizing (structuring) agent;
- c) from about 1% to about 50%, from about 1% to about 20%, or from about 2% to about 10% of a viscosity enhancer;
- d) from about 1% to about 50%, from about 1% to about 20%, or from about 2% to about 10% of a surfactant;
- e) from about 0.1% to about 90%, from about 0.1% to about 20%, or from about 1% to about 10% of a skin care ingredient;
- f) from about 0.1% to about 30%, from about 0.1% to about 10%, or from about 0.1% to about 5% of an enzyme inhibitor;
- g) from about 0.1% to about 10%, from about 0.1% to about 5%, or from about 0.1% to about 1% of a vitamin;
- h) from about 1% to about 50%, from about 1% to about 20%, or from about 2% to about 10% of a moisturizer or humectant;
- i) from about 0.01 % to about 5%, from about 0.1% to about 2%, or from about 0.1% to about 1% of a perfume;
- j) from about 0.02% to about 10%, from about 0.2% to about 5%, or from about 0.2% to about 2% of a perfume delivery system;

- k) from about 1% to about 90%, from about 1% to about 50%, or from about 1% to about 25% of a skin aesthetics/skin feel ingredient; and
- l) mixtures thereof.

5 Consumer Product Adjunct Materials

The disclosed compositions may include additional adjunct ingredients that include: emollients, structuring agents, viscosity enhancers, surfactants, skin care ingredients, vitamins, moisturizers, perfumes, aesthetic ingredients, enzyme inhibitors, and combinations thereof.

Emollients

10 Emollients useful in the present invention can be petroleum-based, fatty acid ester type, alkyl ethoxylate type, fatty acid ester ethoxylates, fatty alcohol type, polysiloxane type, or mixtures of these emollients. Suitable petroleum-based emollients include those hydrocarbons, or mixtures of hydrocarbons, having chain lengths of from 16 to 32 carbon atoms. Petroleum based hydrocarbons having these chain lengths include mineral oil (also known as “liquid petrolatum”) and petrolatum
15 (also known as “mineral wax,” “petroleum jelly” and “mineral jelly”). Mineral oil usually refers to less viscous mixtures of hydrocarbons having from 16 to 20 carbon atoms. Petrolatum usually refers to more viscous mixtures of hydrocarbons having from 16 to 32 carbon atoms. Petrolatum and mineral oil are particularly preferred emollients for lotion compositions of the present invention.

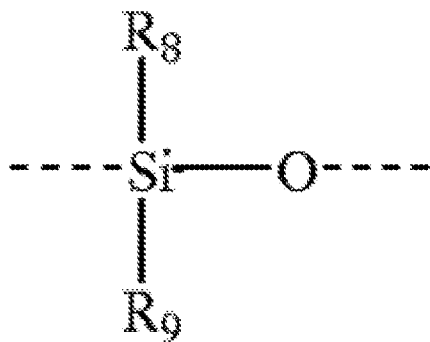
20 Suitable fatty acid ester type emollients include those derived from C14-C28 fatty acids, preferably C16-C22 saturated fatty acids, and short chain (C1-C8, preferably C1-C3) monohydric alcohols. Representative examples of such esters include methyl palmitate, methyl stearate, isopropyl laurate, isopropyl myristate, isopropyl palmitate, ethylhexyl palmitate and mixtures thereof. Suitable fatty acid ester emollients can also be derived from esters of longer chain fatty
25 alcohols (C14-C28, preferably C14-C16) and shorter chain fatty acids e.g., lactic acid, such as lauryl lactate and cetyl lactate.

Suitable alkyl ethoxylate type emollients include C14-C22 fatty alcohol ethoxylates having an average degree of ethoxylation of 4 or less. Preferably, the fatty alcohol ethoxylate emollient is selected from the group consisting of lauryl, cetyl, and stearyl ethoxylates, and mixtures thereof,
30 having an average degree of ethoxylation ranging from about of 4 or less. These alkyl ethoxylate emollients are typically used in combination with the petroleum-based emollients, such as petrolatum, at a weight ratio of alkyl ethoxylate emollient to petroleum-based emollient of from

about 1:1 to about 1:5, preferably from about 1:2 to about 1:4. For each of the compositions disclosed herein, having an average degree of ethoxylation of 4 or less enables the lotion of the present invention to exhibit a significant hydrophobicity, and typically exhibits an HLB of less than about 7. The hydrophobicity of the lotion is a property in delivering the benefit of cleaner skin and hair, i.e., less menses on the skin and hair or hair of the wearer.

Suitable fatty alcohol type emollients include C14-C22 fatty alcohols, preferably C16-C18 fatty alcohols. Representative examples include cetyl alcohol and stearyl alcohol, and mixtures thereof. These fatty alcohol emollients are typically used in combination with the petroleum-based emollients, such as petrolatum, at a weight ratio of fatty alcohol emollient to petroleum-based emollient of from about 1:1 to about 1:5, preferably from about 1:1 to about 1:2.

Other suitable types of emollients for use in the present invention include polysiloxane compounds. In general suitable polysiloxane materials for use in the present invention include those having monomeric siloxane units of the following structure:



wherein, R1 and R2, for each independent siloxane monomeric unit can each independently be hydrogen or any alkyl, aryl, alkenyl, alkaryl, arakyl, cycloalkyl, halogenated hydrocarbon, or other radical. Any of such radicals can be substituted or unsubstituted. R1 and R2 radicals of any particular monomeric unit may differ from the corresponding functionalities of the next adjoining monomeric unit. Additionally, the polysiloxane can be either a straight chain, a branched chain or have a cyclic structure. The radicals R1 and R2 can additionally independently be other silaceous functionalities such as, but not limited to siloxanes, polysiloxanes, silanes, and polysilanes. The radicals R1 and R2 may contain any of a variety of organic functionalities including, for example, alcohol, carboxylic acid, phenyl, and amine functionalities.

Exemplary alkyl radicals are methyl, ethyl, propyl, butyl, pentyl, hexyl, octyl, decyl, octadecyl, and the like. Exemplary alkenyl radicals are vinyl, allyl, and the like. Exemplary aryl radicals are phenyl, diphenyl, naphthyl, and the like. Exemplary alkaryl radicals are toyl, xylyl, ethylphenyl, and the like. Exemplary aralkyl radicals are benzyl, alpha-phenylethyl, beta-phenylethyl, alpha-phenylbutyl, and the like. Exemplary cycloalkyl radicals are cyclobutyl, cyclopentyl, cyclohexyl, and the like. Exemplary halogenated hydrocarbon radicals are chloromethyl, bromoethyl, tetrafluorethyl, fluorethyl, trifluorethyl, trifluorotloyl, hexafluoroxylyl, and the like.

Viscosity of polysiloxanes may vary as widely as the viscosity of polysiloxanes in general vary, so long as the polysiloxane is flowable or can be made to be flowable for application to the sanitary napkin topsheet. This includes, but is not limited to, viscosity as low as 5 centistokes (at 37 degrees C. as measured by a glass viscometer) to about 20,000,000 centistokes. Preferably the polysiloxanes have a viscosity at 37 degrees C. ranging from about 5 to about 5,000 centistokes, more preferably from about 5 to about 2,000 centistokes, most preferably from about 100 to about 1000 centistokes. High viscosity polysiloxanes which themselves are resistant to flowing can be effectively deposited upon the sanitary napkin topsheets.

Preferred polysiloxanes compounds for use in the present invention are disclosed in U.S. Pat. No. 5,059,282 (Ampulski et al), issued Oct. 22, 1991, which is incorporated herein by reference. Particularly preferred polysiloxane compounds for use as emollients in the lotion compositions of the present invention include phenyl-functional polymethylsiloxane compounds (e.g., Dow Corning 556 Cosmetic-Grade Fluid: polyphenylmethyilsiloxane) and cetyl or stearyl fictionalized dimethicones such as Dow 2502 and Dow 2503 polysiloxane fluids, respectively. In addition to such substitution with phenyl-functional or alkyl groups, effective substitution may be made with amino, carboxyl, hydroxyl, ether, polyether, aldehyde, ketone, amide, ester, and thiol groups. Of these effective substituent groups, the family of groups comprising phenyl, amino, alkyl, carboxyl, and hydroxyl groups are more preferred than the others; and phenyl-functional groups are most preferred.

Besides petroleum-based emollients, fatty acid ester emollients, fatty acid ester ethoxylates, alkyl ethoxylate emollients fatty alcohol emollients, and polysiloxanes, the emollients useful in the present invention can include minor amounts (e.g., up to about 10% of the total emollient) of other, conventional emollients. These other, conventional emollients include spermaceti or other waxes, fatty acids, and fatty alcohol ethers having from 14 to 28 carbon atoms in their fatty chain, such as

stearic acid, propoxylated fatty alcohols; other fatty esters of polyhydroxy alcohols; lanolin and its derivatives. These other emollients should be included in a manner such that the solid or semisolid characteristics of the lotion composition are maintained.

The amount of emollient that can be included in the lotion composition will depend on a variety of factors, including the particular emollient involved, the lotion-like benefits desired, the other components in the lotion composition and like factors. The lotion composition can comprise from about 10 to about 95% of the emollient. Preferably, the lotion composition comprises from about 20 to about 80%, most preferably from about 40 to about 75%, of the emollient.

Immobilizing (Structuring) Agent

The immobilizing agent counteracts this tendency of the emollient to migrate or flow by keeping the emollient primarily localized on the surface of the sanitary napkin top sheet to which the lotion composition is applied. This is believed to be due, in part, to the fact that the immobilizing agent raises the melting point of the lotion composition above that of the emollient. Since the immobilizing agent is also miscible with the emollient (or solubilized in the emollient with the aid of an appropriate emulsifier), it entraps the emollient on the surface of the sanitary napkin topsheet as well.

It is also advantageous to “lock” the immobilizing agent on the surface of the sanitary napkin topsheet. This can be accomplished by using immobilizing agents which quickly crystallize (i.e., solidify) at the surface of the topsheet. In addition, outside cooling of the treated sanitary napkin topsheet via blowers, fans, etc. can speed up crystallization of the immobilizing agent.

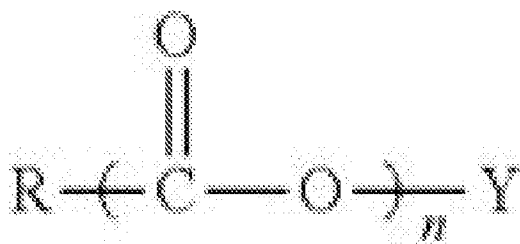
In addition to being miscible with (or solubilized in) the emollient, the immobilizing agent needs to have a melting point of at least about 35 degrees C. This is so the immobilizing agent itself will not have a tendency to migrate or flow. Preferred immobilizing agents will have melting points of at least about 40 degrees C. Typically, the immobilizing agent will have a melting point in the range of from about 50 degrees to about 150 degrees C.

Suitable immobilizing agents for the present invention can comprise a member selected from the group consisting of C14-C22 fatty alcohols, C14-C22 fatty acids, and C14-C22 fatty alcohol ethoxylates having an average degree of ethoxylation of 4 or less, and mixtures thereof. Preferred immobilizing agents include C16-C18 fatty alcohols, most preferably selected from the group consisting of cetyl alcohol, stearyl alcohol, and mixtures thereof. Mixtures of cetyl alcohol and stearyl alcohol are particularly preferred. Other preferred immobilizing agents include C16-C18 fatty acids, most preferably selected from the group consisting of palmitic acid, stearic acid, and mixtures

thereof. Mixtures of palmitic acid and stearic acid are particularly preferred. Still other preferred immobilizing agents include C16-C18 fatty alcohol ethoxylates having an average degree of ethoxylation for 4 or less. Preferably, the fatty alcohols, fatty acids and fatty alcohols are linear. Again, as noted above, having an average degree of ethoxylation of 4 or less enables the lotion of the present invention to exhibit significant hydrophobicity, and typically exhibits an HLB of less than about 7. The hydrophobicity of the lotion is a property in delivering the benefit of cleaner skin and hair, i.e., less menses on the skin and hair or hair of the wearer.

Other types of immobilizing agents can be used either alone or in combination with the fatty alcohols, fatty acids, and fatty alcohol ethoxylates described above. Examples of these other types of immobilizing agents includes polyhydroxy fatty acid esters, polyhydroxy fatty acid amides, and mixtures thereof. Preferred esters and amides will have three or more free hydroxy groups on the polyhydroxy moiety and are typically nonionic in character. Because of the possible skin and hair sensitivity of those using sanitary napkin topsheets to which the lotion composition is applied, these esters and amides should also be relatively mild and non-irritating to the skin and hair.

Suitable polyhydroxy fatty acid esters for use in the present invention will have the formula:



where in R is a C5-C31 hydrocarbyl group, preferably straight chain C7-C19 alkyl or alkenyl, more preferably straight chain C9-C17 alkyl or alkenyl, most preferably straight chain C11-C17 alkyl or alkenyl, or mixture thereof, Y is a polyhydroxyhydrocarbyl moiety having a hydrocarbyl chain with at least 2 free hydroxyls directly connected to the chain; and n is at least 1. Suitable Y groups can be derived from polyols such as glycerol, pentaerythritol; sugars such as raffinose, maltodextrose, galactose, sucrose, glucose, xylose, fructose, maltose, lactose, mannose and erythrose; sugar alcohols such as erythritol, xylitol, malitol, mannitol and sorbitol; and anhydrides of sugar alcohols such as sorbitan.

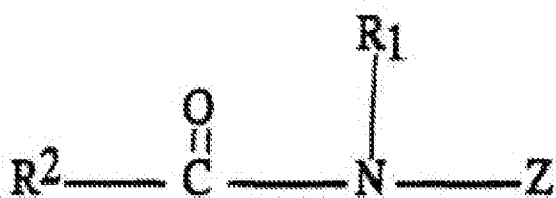
One class of suitable polyhydroxy fatty acid esters for use in the present invention comprises certain sorbitan esters, preferably the sorbitan esters of C16-C22 saturated fatty acids. Because of the manner in which they are typically manufactured, these sorbitan esters usually comprise mixtures of mono-, di-, tri- etc. esters. Representative examples of suitable sorbitan esters include sorbitan

palmitates (e.g., SPAN 40), sorbitan stearates (e.g., SPAN 60), and sorbitan behenates, that comprise one or more of the mono-, di- and tri-ester versions of these sorbitan esters, e.g., sorbitan mono-, di- and tri-palmitate, sorbitan mono-, di- and tri-stearate, sorbitan mono-, di- and tri-behenate, as well as mixed tallow fatty acid sorbitan mono-, di- and tri-esters. Mixtures of different sorbitan esters can also be used, such as sorbitan palmitates with sorbitan stearates. Particularly preferred sorbitan esters are the sorbitan stearates, typically as a mixture of mono-, di- and tri-esters (plus some tetraester) such as SPAN 60, and sorbitan stearates sold under the trade name GLYCOMUL-S by Lonza, Inc. Although these sorbitan esters typically contain mixtures of mono-, di- and trimesters, plus some tetraester, the mono- and di-esters are usually the predominant species in these mixtures.

Another class of suitable polyhydroxy fatty acid esters for use in the present invention comprises certain glyceryl monoesters, preferably glyceryl monoesters of C16-C22 saturated fatty acids such as glyceryl monostearate, glyceryl monopalmitate, and glyceryl monobehenate. Again, like the sorbitan esters, glyceryl monoester mixtures will typically contain some di- and triester. However, such mixtures should contain predominantly the glyceryl monoester species to be useful in the present invention.

Another class of suitable polyhydroxy fatty acid ester for use in the present invention comprise certain sucrose fatty acid esters, preferably the C14-C22 saturated fatty acid esters of sucrose. Sucrose monoesters and diesters are particularly preferred and include sucrose mono- and di-stearate and sucrose mono- and di-laurate.

Suitable polyhydroxy fatty acid amides for use in the present invention will have the formula:



where-in R¹ is H, C1-C4 hydrocarbyl, 2-hydroxyethyl, 2-hydroxypropyl, methoxyethyl, methoxypropyl or a mixture thereof, preferably C1-C4 alkyl, methoxyethyl or methoxypropyl, more preferably C1 or C2 alkyl or methoxypropyl, most preferably C1 alkyl (i.e., methyl) or methoxypropyl; and R² is a C5-C31 hydrocarbyl group, preferably straight chain C7-C19 alkyl or alkenyl, more preferably straight chain C9-C17 alkyl or alkenyl, most preferably straight chain C1-C17 alkyl or alkenyl, or mixture thereof; and Z is a polyhydroxyhydrocarbyl moiety having a linear hydrocarbyl chain with at least 3 hydroxyls directly connected to the chain. See U.S. Pat. No.

5,174,927 (Honsa), issued Dec. 29, 1992 (herein incorporated by reference) which discloses these polyhydroxy fatty acid amides, as well as their preparation.

The Z moiety preferably will be derived from a reducing sugar in a reductive amination reaction; most preferably glycityl. Suitable reducing sugars include glucose, fructose, maltose, lactose, galactose, mannose, and xylose. High dextrose corn syrup, high fructose corn syrup, and high maitose corn syrup can be utilized, as well as the individual sugars listed above. These corn syrups can yield mixtures of sugar components for the Z moiety.

The Z moiety preferably will be selected from the group consisting of $-\text{CH}_2-(\text{CHOH})_n-\text{CH}_2\text{OH}$, $-\text{CH}(\text{CH}_2\text{OH})-[(\text{CHOH})_{n-1}]-\text{CH}_2\text{OH}$, $-\text{CH}_2\text{OH}-\text{CH}_2-(\text{CHOH})_2(\text{CHOR}_3)(\text{CHOH})-\text{CH}_2\text{OH}$, where n is an integer from 3 to 5, and R₃ is H or a cyclic or aliphatic monosaccharide. Most preferred are the glycityls where n is 4, particularly $-\text{CH}_2-(\text{CHOH})_4-\text{CH}_2\text{OH}$.

In the above formula, R₁ can be, for example, N-methyl, N-ethyl, N-propyl, N-isopropyl, N-butyl, N-2-hydroxyethyl, N-methoxypropyl or N-2-hydroxypropyl, R₂ can be selected to provide, for example, cocamides, stearamides, oleamides, lauramides, myristamides, capricamides, palmitamides, tallowamides, etc. The Z moiety can be 1-deoxyglucityl, 2-eoxyfructityl, 1-deoxymaltityl, 1-deoxy-lactityl, 1-deoxygalactityl, 1-deoxymannityl, 1-deoxymaltotriosityl.

Other types of ingredients that can be used as immobilizing agents, either alone, or in combination with the above-mentioned immobilizing agents, include waxes such as carnauba, beeswax, catidelilla, paraffin, ceresin, esparto, ouricuri, rezowax, and other known waxes. Preferably the wax is a paraffin wax. An example of a particularly preferred paraffin wax is Parrafin S. P. 434 from Strahl and Pitsch Inc. P.O. Box 1098 West Babylon, N.Y. 11704.

The amount of immobilizing agent that should be included in the lotion composition will depend on a variety of factors, including the particular emollient involved, the particular immobilizing agent involved, whether an emulsifier is required to solubilize the immobilizing agent in the emollient, the other components in the lotion composition and like factors. The lotion composition can comprise from about 5 to about 90% of the immobilizing agent. Preferably, the lotion composition comprises from about 5 to about 50%, most preferably from about 10 to about 40%, of the immobilizing agent.

Viscosity Enhancers

In addition to the components already described, the compositions of the invention may further include from about 0.1 to about 40 percent by weight of one or more compounds acting as viscosity enhancers that increase the meltpoint viscosity of the emollients of the composition. More specifically, the compositions include from about 5 to about 20 percent by weight of one or more viscosity enhancers. Even more specifically, the compositions include from about 10 to about 15 percent by weight of viscosity enhancer(s). The viscosity enhancer increases the meltpoint viscosity of the compositions to have a high viscosity under low shear and at the "hot box car" stability temperature of approximately 54.5° C. Having high viscosity (>50,000 centipoise) at elevated temperatures prevents the compositions from migrating into or away from the materials to which they are applied. However, the viscosity enhancer component also provides a low viscosity (<5,000 centipoise) for the compositions under high shear and at processing temperatures. The viscosity enhancers of the invention are capable of providing a desirable viscosity, depending on shear and temperature conditions, for compositions having a range of melting points. While it is desirable for compositions of the invention to have increased viscosity under "hot box car" stability conditions, the increased viscosity can be maintained, in part, through the use of one or more viscosity enhancers up to the melting point of the particular composition. Typically, process temperatures are approximately 5° C. above the melting point of the composition. Examples of suitable viscosity enhancers include polyolefin resins, lipophilic/oil thickeners, ethylene/vinyl acetate copolymers, organically modified clays, polyethylene, silica, silica silylate, silica methyl silylate, colloidal silicone dioxide, alkyl hydroxy ethyl cellulose, other organically modified celluloses, PVP/decane copolymer, PVM/MA decadiene crosspolymer, PVP/eicosene copolymer, PVP/hexadecane copolymer, microcrystalline wax, hexadecyl-cosanyl-hexacosanate, shellac wax, glycol montanate, PEG-12 carnauba, synthetic paraffin, ozokerite, C20-C40 alkyl hydroxystearyl stearate, polyperfluoromethylisopropylether montan wax and mixtures of these compounds. Many of the solidifying agents, also described herein, have been found to provide the same benefits to the compositions of the invention as the viscosity enhancers.

The viscosity enhancers are selected to influence the rheological properties of the compositions. For example, one or more viscosity enhancers can be selected so that the composition has a viscosity of greater than about 50,000 centipoise at temperatures of about 55° C. and lower under low shear. Additionally, one or more viscosity enhancers can be selected so that the composition has a viscosity less than about 5,000 centipoise at temperatures of about 60° C. and higher under shear for processing conditions.

Surfactants

As mentioned above, it is highly desirable that the article topsheet is made of a hydrophilic material to promote rapid transfer of liquids (e.g., urine) through the topsheet. Similarly, it is important that the lotion composition also be sufficiently wettable to ensure that liquids will transfer through the topsheet more rapidly. This diminishes the likelihood that body exudates will flow off the lotion coating rather than being drawn through the topsheet and being absorbed by the absorbent core. Depending upon the particular immobilizing agent used in the lotion composition of the present invention, an additional hydrophilic surfactant (or a mixture of hydrophilic surfactants) may, or may not, be required to improve wettability. For example, some immobilizing agents, such as N-cocoyl-N-methoxypropyl glucamide have HLB values of at least about 7 and are sufficiently wettable without the addition of hydrophilic surfactant. Other immobilizing agents such as the C₁₆-C₁₈ fatty alcohols having HLB values below about 7 will require addition of hydrophilic surfactant to improve wettability when the lotion composition is applied to article topsheets. Similarly, a hydrophobic emollient such as petrolatum will require the addition of a hydrophilic surfactant.

Suitable hydrophilic surfactants will be miscible with the emollient and the immobilizing agent so as to form homogeneous mixtures. Because of possible skin sensitivity of those using disposable absorbent products to which the lotion composition is applied, these surfactants should also be relatively mild and non-irritating to the skin. Typically, these hydrophilic surfactants are nonionic to be not only non-irritating to the skin, but also to avoid other undesirable effects on any underlying tissue laminate structure, e.g., reductions in tensile strength.

Suitable nonionic surfactants may be substantially nonmigratory after the lotion composition is applied to the article topsheets and will typically have HLB values in the range of from about 4 to about 20, preferably from about 7 to about 20. To be nonmigratory, these nonionic surfactants will typically have melt temperatures greater than the temperatures commonly encountered during storage, shipping, merchandising, and use of disposable absorbent products, e.g., at least about 30° C. In this regard, these nonionic surfactants will preferably have melting points similar to those of the immobilizing agents previously described.

Suitable nonionic surfactants for use in lotion compositions of the present invention include alkylglycosides; alkylglycoside ethers as described in U.S. Pat. No. 4,011,389 (Langdon, et al), issued Mar. 8, 1977; alkylpolyethoxylated esters such as Pegosperse 1000MS (available from Lonza, Inc., Fair Lawn, N.J.), ethoxylated sorbitan mono-, di- and/or tri-esters of C₁₂-C₁₈ fatty acids having an average degree of ethoxylation of from about 2 to about 20, preferably from about 2 to about 10,

such as TWEEN 60 (sorbitan esters of stearic acid having an average degree of ethoxylation of about 20) and TWEEN 61 (sorbitan esters of stearic acid having an average degree of ethoxylation of about 4), and the condensation products of aliphatic alcohols with from about 1 to about 54 moles of ethylene oxide. The alkyl chain of the aliphatic alcohol is typically in a straight chain (linear) configuration and contains from about 8 to about 22 carbon atoms. Particularly preferred are the condensation products of alcohols having an alkyl group containing from about 11 to about 22 carbon atoms with from about 2 to about moles of ethylene oxide per mole of alcohol. Examples of such ethoxylated alcohols include the condensation products of myristyl alcohol with 7 moles of ethylene oxide per mole of alcohol, the condensation products of coconut alcohol (a mixture of fatty alcohols having alkyl chains varying in length from 10 to 14 carbon atoms) with about 6 moles of ethylene oxide. A number of suitable ethoxylated alcohols are commercially available, including TERGITOL 15-S-9 (the condensation product of C₁₁-C₁₅ linear alcohols with 9 moles of ethylene oxide), marketed by Union Carbide Corporation; KYRO EOB (condensation product of C₁₃-C₁₅ linear alcohols with 9 moles of ethylene oxide), marketed by The Procter & Gamble Co., the NEODOL brand name surfactants marketed by Shell Chemical Co., in particular NEODOL 25-12 (condensation product of C₁₂-C₁₅ linear alcohols with 12 moles of ethylene oxide) and NEODOL 23-6.5T (condensation product of C₁₂-C₁₃ linear alcohols with 6.5 moles of ethylene oxide that has been distilled (topped) to remove certain impurities), and especially the PLURAFAC brand name surfactants marketed by BASF Corp., in particular PLURAFAC A-38 (a condensation product of a C₁₈ straight chain alcohol with 27 moles of ethylene oxide). (Certain of the hydrophilic surfactants, in particular ethoxylated alcohols such as NEODOL 25-12, can also function as alkyl ethoxylate emollients). Other examples of preferred ethoxylated alcohol surfactants include ICI's class of Brij surfactants and mixtures thereof, with Brij 72 (i.e., Steareth-2) and Brij 76 (i.e., Steareth-10) being especially preferred. Also, mixtures of cetyl alcohol and stearyl alcohol ethoxylated to an average degree of ethoxylation of from about 10 to about 20 may also be used as the hydrophilic surfactant.

Another type of suitable surfactant for use in the present invention includes Aerosol OT, a dioctyl ester of sodium sulfosuccinic acid marketed by American Cyanamid Company.

Still another type of suitable surfactant for use in the present invention includes silicone copolymers such as General Electric SF 1188 (a copolymer of a polydimethylsiloxane and a polyoxyalkylene ether) and General Electric SF 1228 (a silicone polyether copolymer). These silicone surfactants can be used in combination with the other types of hydrophilic surfactants discussed above, such as the ethoxylated alcohols. These silicone surfactants have been found to be

effective at concentrations as low as 0.1%, more preferably from about 0.25 to about 1.0%, by weight of the lotion composition.

The amount of hydrophilic surfactant required to increase the wettability of the lotion composition to a desired level will depend upon the HLB value and level of immobilizing agent used, the HLB value of the surfactant used and like factors. The lotion composition can comprise from about 1 to about 50% of the hydrophilic surfactant when needed to increase the wettability properties of the composition. Preferably, the lotion composition comprises from about 1 to about 25%, most preferably from about 10 to about 20%, of the hydrophilic surfactant when needed to increase wettability.

Skin Care Ingredients

Various skin care ingredients that may be incorporated into the skin care compositions provide various skin benefits, such as reduction in redness, improvement in skin appearance and/or condition, formation of a barrier or protective layer, or reduction of irritants in body wastes. A host of skin care ingredients can be incorporated into a carrier and applied to the skin. These skin care ingredients include, but are not limited to, barrier substances (petrolatum), skin conditioning agents (oil, lanolin), proton donating agents, protease and/or enzyme inhibitors, and antimicrobials. The skin care composition may also contain humectants (glycerine, sorbitol), vitamins, skin soothing agents, such as aloe vera, or other ingredients from herbal, botanical or mineral sources, or multi-functional agents, such as zinc oxide.

A wide variety of topically effective ingredients can be incorporated into the stable composition. Such skin care ingredient provides visible benefits to the occluded skin under an absorbent article when applied. The skin care ingredients can be uniformly dispersed throughout the composition as insoluble particulates. Alternatively, the skin care ingredients can be solubilized in the substantially anhydrous carrier. The resultant composition is substantially stable (i.e., resistant to excessively large agglomeration, stratification and/or settling), has a solid or semi-solid consistency at room temperature that renders it readily transferable to the skin, and is suitable for topical application to the skin via a delivery vehicle such as an absorbent article or elements thereof.

Numerous materials that have been deemed safe and effective skin care ingredients are logical materials for use herein. Such materials include Category I and Category III actives as defined by the U.S. Food and Drug Administration's (FDA) Tentative Final Monograph on Skin Protectant Drug Products for Over-the-Counter Human Use (21 C.F.R. §347). It will be recognized

that several of the monographed actives listed below are “emollients” as defined herein. Category I actives presently include: allantoin, aluminum hydroxide gel, calamine, cocoa butter, dimethicone, cod liver oil (in combination), glycerine, kaolin, petrolatum, lanolin, mineral oil, shark liver oil, white petrolatum, talc, topical starch, zinc acetate, zinc carbonate, zinc oxide, and the like. Category

5 III actives presently include: live yeast cell derivatives, aldioxa, aluminum acetate, microporous cellulose, cholecalciferol, colloidal oatmeal, cysteine hydrochloride, dexpanthenol, Peruvian balsam oil, protein hydrolysates, racemic methionine, sodium bicarbonate, Vitamin A, and the like. These monographed materials are known to provide multiple skin benefits, such as skin protectant, itch prevention, irritation prevention, via various mechanisms.

10 The skin care ingredients may also include, but are not limited to, pH control agents or proton donating agents, such as pH buffer systems, ammonium-neutralizing agents, organic acids, polymeric acids, inorganic acids, and their salts; anti-microbials; enzyme inhibitors; protease inhibitors; anti-coenzymes; chelating agents; and anti-bodies. Some nonlimiting examples of proton donating agents are described in U.S. application Ser. No. 09/041,509, by McOsker et al. filed on

15 Mar. 12, 1998.

Protease inhibitors can be divided into two general classes: the proteinases and the peptidases. Proteinases act on specific interior peptide bonds of proteins and peptidases act on peptide bonds adjacent to a free amino or carboxyl group on the end of a protein and thus cleave the protein from the outside. The protease inhibitors suitable for use in the present invention include, but

20 are not limited to, proteinases such as serine proteases, metalloproteases, cysteine proteases, and aspartyl protease, and peptidases, such as carboxypeptidases, dipeptidases and aminopeptidases. Some non-limiting examples of such protease inhibitors are described in U.S. application Ser. No. 09/041,232, by Rourke et al filed on Mar. 12, 1998, U.S. Pat. No. 5,091,193 issued to Enjolras et al, on Feb. 25, 1992, and U.S. Pat. No. 4,556,560 issued to Buckingham on Dec. 3, 1985, all are

25 incorporated by reference herein.

Enzyme inhibitors are designed to inhibit specific enzymatic activities of various classes of proteases. Specifically useful for the present invention are inhibitors that interact with those proteolytic and lipolytic enzymes commonly present in feces, such as lipases, esterases, diesterases, ureases, amylases, elastases, nucleases, The enzyme inhibitors suitable for use in the present

30 invention include, but are not limited to, chelating agents which bind to metal cofactors of specific enzymes, antibodies raised for specific enzymes, enzyme inhibitors for various enzymes or coenzymes, preferably of the proteolytic type, such as trypsin, chymotrypsin, aminopeptidase and

elastase, serine, cysteine, lipases, bile salts (acting as coenzymes that enhance the activities of lipases), amylases, and/or ureases. Other enzyme inhibitors known to effectively reduce or interfere with enzyme activities are also contemplated to be within the scope of the present invention. Some non-limiting examples of such enzyme inhibitors are described in U.S. application Ser. No. 09/041,266, by Roe et al. and U.S. application Ser. No. 09/041,196, by Underiner et al., both filed on Mar. 12, 1998, U.S. Pat. No. 5,376,655 issued to Imaki et al. on Dec. 27, 1994, U.S. Pat. No. 5,091,193 issued to Enjolras et al. on Feb. 25, 1992, U.S. Pat. No. 3,935,862 issued to Kraskin on Feb. 3, 1976, U.S. Pat. No. 5,409,903 issued to Polak et al. on Apr. 25, 1995, U.S. Pat. No. 4,556,560 issued to Buckingham on Dec. 3, 1985, Patent Application EP 97/120,699 and EP 97/120,700 both by Polumbo et al. and filed on Nov. 26, 1997, all are incorporated by reference herein.

The skin care ingredients in the present invention should preferably include at least one of the following: zinc oxide, talc, starch, allantoin, hexamidine and its salts and derivatives, hexamidine diisethionate, and its salts, triacetin, phytic acid, ethylenediamine tetraacetic acid (EDTA), and 4-(2-aminoethyl)-benzenesulfonylfluoride hydrochloride, chitosan, and mixtures thereof.

Generally, a safe and effective amount of a skin care ingredient is incorporated into the composition. The skin care compositions suitable for the present invention may contain skin care ingredients in a concentration of from about 0.001% to about 70% by weight, preferably from about 0.01% to about 45%, more preferably from about 0.1% to about 25%, and most preferably from about 0.1% to about 10%. The skin care ingredients may be used singly or as a mixture of skin care ingredients in a "cocktail". Because of the variety of skin care ingredients that may be used in the present invention, the effective concentration of each skin care ingredient should be separately determined, as known to those skilled in the art.

Where the ingredients are insoluble in the composition, the average particle size of the ingredients plays an important role in suspending the particles in the composition without substantial agglomeration, stratification and/or settling. The particles should be substantially free of excessively large agglomerates, i.e., there is negligible amount of particles larger than 1000 microns. The average particle size of the skin care ingredients should preferably be less than about 1000 microns, more preferably less than about 100 microns, and most preferably less than about 50 microns.

It is generally known that solid particles in neat form tend to form clumps or agglomerates, bound by static charges, interactions between functional groups, etc. It is often necessary to break up the clumps in order to disperse the particles, to reduce the settling effect, and to deliver skin benefits

effectively. The break-up and dispersion can be accomplished by grinding or milling, by incorporation into a composition with agitation, by predispersing in a dispersant mixture, by predissolving in a carrier or by other methods known to persons skilled in the art.

The predispersant mixture preferably comprises a dispersant fluid and optionally, a wetting agent. The wetting agent is typically a surfactant having a hydrophilic end, which interacts with the functional groups on the surface of the ingredient particles, and a lipophilic end, which is compatible with the oil-based carrier of the present composition. Without intending to be bound by theory, it is believed that the wetting agent, along with external forces applied (such as shear, agitation), facilitates the break-up of the clumps of the skin care ingredients and the mixing or dispersion of the particulate ingredients in the composition. It is also believed that the wetting agent, being a hydrophilic-lipophilic, surfactant-type material, bridges the interfaces between the particulate ingredients and the substantially anhydrous carrier. It is also believed that the dispersant fluid can serve as a diluent and/or a wetting agent for predispersing the particles. Additionally, the dispersant fluid preferably is miscible with the substantially anhydrous, oleaginous composition of the present invention. Nonlimiting examples of the dispersant fluid include mineral oil, dimethicone and other silicones, esters, preferably the condensation products of C_1 - C_{22} alcohols with C_1 - C_{22} acids. The predispersion preferably has a high solid or particle content in the range of 50% to 99% by weight solids, more preferably from 60% to 90% by weight solids, and most preferably from 70% to 80% by weight solids. Various grinding and/or milling techniques known in the art are sometimes used in the predispersing process to break down the particle size and disperse the particles.

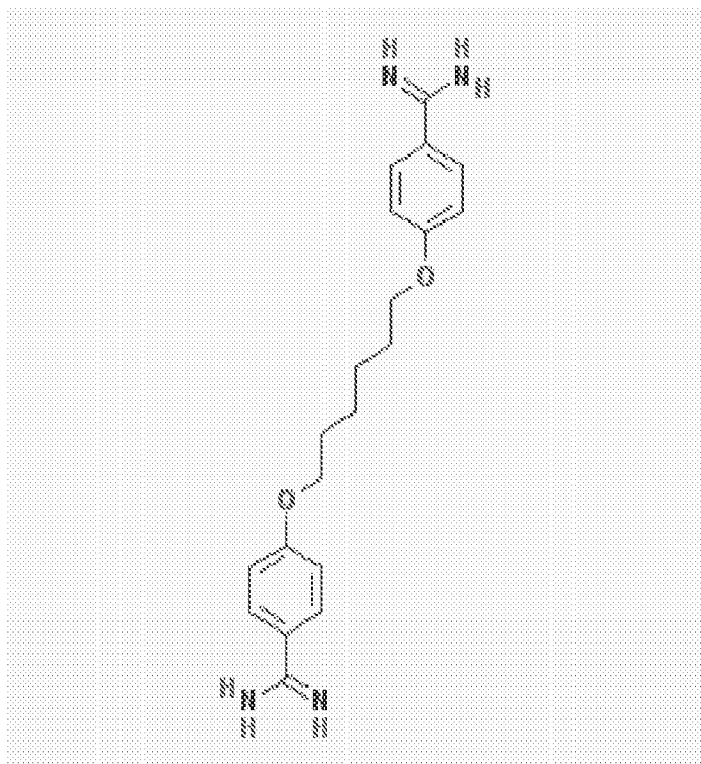
In a preferred embodiment, the ingredient is zinc oxide dispersed, as insoluble particles, in the oleaginous, substantially anhydrous carrier of the present invention. More preferably, the zinc oxide particles are prepared as a predispersion. The skin care composition comprises from about 1 wt % to about 70 wt % of the zinc oxide predispersion, preferably from about 3 wt % to about 50 wt %, more preferably from about 5 wt % to about 30 wt %. The predispersion has preferably from about 90 wt % to about 50 wt % zinc oxide, from about 1 wt % to about 50 wt % dispersant fluid and from about 0.1 wt % to about 10 wt % wetting agent. A preferred embodiment comprises about 75 wt % zinc oxide particles dispersed in about 22 wt % of a dispersant fluid such as those described above and about 3 wt % of a polyglyceryl ester wetting agent. Suitable zinc oxide predispersion is available from Kobo Products, Inc., S. Plainfield, N.J. The zinc oxide particles of the present invention typically consist of agglomerates of primary particles. The particle size of the agglomerates ranges from about 0.1 to about 300 microns and the average agglomerate size is about

1.0 microns. The average particle size of the primary particles is about 0.12 microns. Typically the agglomerate comprises about 5 to about 8 primary particles.

Alternatively, a hydrophobic modification can be applied to the zinc oxide particles to “wet” the surface of the particles. In this process, surfactants are actually attached to the surface of the zinc oxide particles under high temperature or pressure. The modified or “wetted” zinc oxide particles with the lipophilic ends of the surfactants extending from their surfaces, become at least partially miscible in the oil-based carrier of the present compositions.

Additional skin care compositions may comprise panthenol triacetate (a derivative of vitamin B5), niacin, and hexamidine/hexamidine derivatives.

The skin care compositions may comprise hexamidine skin treatment agent at concentrations ranging from about 0.001% to about 0.1%, from about 0.005% to about 0.1%, or even from about 0.01% to about 0.1% by weight of the composition. The hexamidine skin treatment agent suitable for use herein include those aromatic diamines which generally conform to the following formula:



These aromatic diamines are referred to as 4,4'-[1,6-Hexanediylbis(oxy)]bisbenzenecarboximidamide; 4,4'-(hexamethylenedioxy)dibenzamidine; and 4,4'-diamidino- α,ω -diphenoxyhexane. The most popular employed form of hexamidine is the general category of hexmidine salts, which include acetate, salicylate, lactate, gluconate, tartarate, citrate, phosphate, borate, nitrate, sulfate, and hydrochloride salts of hexamidine. Specific

nonlimiting examples of hexamidine salts include hexamidine isethionate, hexamidine diisethionate, hexamidine hydrochloride, hexamidine gluconate, and mixtures thereof. Hexamidine isethionate and hexamidine diisethionate are β -hydroxyethane sulfonate salts of hexamidine which are preferred for use herein as a skin treatment agent in the prevention and/or treatment of skin disorders. Hexamidine diisethionate is the most preferred hexamidine compound suitable for use as the skin treatment agent herein and is available from Laboratories Serolobologiques (Pulnoy, France) and the Cognis Incorporation (Cincinnati, Ohio) under the tradename ELASTAB HP100.

Hexamidine compounds are known as effective skin treatment agents that can control microbial growth that can lead to irritating and itching skin disorders. Therefore, these skin treatment agents are often referred to as antimicrobial agents. As used herein the term "antimicrobial agents" refer to materials which function to destroy or suppress the growth or metabolism of microbes, and include the general classification of antibacterial, antifungal, antiprotozoal, antiparasitic, and antiviral agents.

It has been found, however, that a low concentration (about 0.1% or less by weight) of hexamidine provides for improved reduction and/or prevention of skin irritating infections, especially when a low amount of hexamidine is combined with a low concentration of other antimicrobial agents such as zinc oxide and/or niacinamide. This combination of hexamidine and zinc oxide and/or niacinamide can be administered topically and internally at a total concentration less than an effective amount of an applied dosage of these individual compounds. As used herein the term "effective amount" refers to an amount which provides a therapeutic benefit with minimal or no adverse reaction in the reduction and/or prevention of any noticeable or unacceptable skin abnormality which causes irritating, acute, or chronic symptoms including itching and inflammation.

Other aromatic diamines are also suitable for use as a skin treatment agent herein. Such compounds include butamidine and derivatives thereof including butamidine isethionate; pentamidine and derivatives thereof including pentamidine isethionate and pentamidine hydrochloride; dibromopropamidine and derivatives thereof including dibromopropamidine isethionate; stilbamidine and derivatives thereof including hydroxystilbamidine, stilbamidine dihydrochloride, and stilbamidine isethionate; diaminodiamidines and derivatives thereof; and mixtures thereof.

Enzyme Inhibitors

Protease inhibitors can be divided into two general classes: the proteinases and the peptidases. Proteinases act on specific interior peptide bonds of proteins and peptidases act on peptide bonds adjacent to a free amino or carboxyl group on the end of a protein and thus cleave the protein from the outside. The protease inhibitors suitable for use in the present invention include, but
5 are not limited to, proteinases such as serine proteases, metalloproteases, cysteine proteases, and aspartyl protease, and peptidases, such as carboxypeptidases, dipeptidases and aminopeptidases. Some non-limiting examples of such protease inhibitors are described in U.S. application Ser. No. 09/041,232, by Rourke et al filed on Mar. 12, 1998, U.S. Pat. No. 5,091,193 issued to Enjolras et al, on Feb. 25, 1992, and U.S. Pat. No. 4,556,560 issued to Buckingham on Dec. 3, 1985, all are
10 incorporated by reference herein.

Enzyme inhibitors are designed to inhibit specific enzymatic activities of various classes of proteases. Specifically useful for the present invention are inhibitors that interact with those proteolytic and lipolytic enzymes commonly present in feces, such as lipases, esterases, diesterases, ureases, amylases, elastases, nucleases, The enzyme inhibitors suitable for use in the present
15 invention include, but are not limited to, chelating agents which bind to metal cofactors of specific enzymes, antibodies raised for specific enzymes, enzyme inhibitors for various enzymes or coenzymes, preferably of the proteolytic type, such as trypsin, chymotrypsin, aminopeptidase and elastase, serine, cysteine, lipases, bile salts (acting as coenzymes that enhance the activities of lipases), amylases, and/or ureases. Other enzyme inhibitors known to effectively reduce or interfere
20 with enzyme activities are also contemplated to be within the scope of the present invention. Some non-limiting examples of such enzyme inhibitors are described in U.S. application Ser. No. 09/041,266, by Roe et al. and U.S. application Ser. No. 09/041,196, by Underiner et al., both filed on Mar. 12, 1998, U.S. Pat. No. 5,376,655 issued to Imaki et al. on Dec. 27, 1994, U.S. Pat. No. 5,091,193 issued to Enjolras et al. on Feb. 25, 1992, U.S. Pat. No. 3,935,862 issued to Kraskin on
25 Feb. 3, 1976, U.S. Pat. No. 5,409,903 issued to Polak et al. on Apr. 25, 1995, U.S. Pat. No. 4,556,560 issued to Buckingham on Dec. 3, 1985, Patent Application EP 97/120,699 and EP 97/120,700 both by Polumbo et al. and filed on Nov. 26, 1997, all are incorporated by reference herein. Protease is a common term employed to represent a group of proteolytic enzymes that are capable of splitting proteins and peptides into fragments by cleaving or hydrolyzing peptide bonds.
30 Proteases can be subclassified into proteinases (endopeptidases) and the peptidases (exopeptidases). Peptidases act on peptide bonds adjacent to a free amino or carboxyl group on the end of a protein and thus cleave the protein from the outside. Among the principal types of peptidases are

carboxypeptidases, dipeptidases and aminopeptidases. Proteinases act on specific interior peptide bonds of proteins and can be subclassified into four kinds, i.e. serine proteases, metalloproteases, cysteine proteases, and aspartyl proteases. Among the principal types of proteinases are trypsin and chymotrypsin. Because proteases are widely distributed in plants, molds, bacteria, milk, milk products, and almost all animal tissues, as well as in digestive juices in the gastrointestinal tract, they are almost always present in the diapered area when it has been soiled by human waste. Each of the protease inhibitors included in the absorbent articles of the invention is a chemical substance which meets at least one of the seven criteria for IC_{50} described above and reversibly or irreversibly inhibits the hydrolytic action of one or more proteases included among the foregoing functional subclasses of proteases normally found in human feces as well as among proteases whose substrate specificity is as yet undefined.

Protease inhibitors that may be employed in the embodiments of the invention include any naturally occurring inhibitor of plant, microbial and/or animal origin (including human), and synthetically manufactured chemical inhibitor that meets the criteria for IC_{50} described above.

Exemplary protease inhibitors that are believed to meet the IC_{50} criteria and are further believed to inhibit the type of protease indicated in parentheses include, but are not limited to, soybean trypsin inhibitor and other plant-derived trypsin inhibitors such as lima bean protease inhibitor, corn protease inhibitor and the like; Bowman Birk inhibitor (serine, trypsin-like protease inhibitor); pancreatic trypsin inhibitor such as bovine pancreatic basic trypsin inhibitor and other animal-derived pancreatic trypsin inhibitors; egg white trypsin inhibitor (serine, trypsin-like protease inhibitor); ovomucoids containing ovoidinogens such as from chicken or turkey egg white (trypsin and chymotrypsin inhibitors); chymostatin (serine, chymotrypsin-like protease inhibitor); aprotinin (serine protease inhibitor); leupeptin and its analogs such as propionyl-leupeptin, N- α -t-BOC-deacetyl-leupeptin (serine and cysteine protease inhibitor); bestatin and its analogs such as epibestatin and nitrobestatin (aminopeptidase metalloprotease inhibitor); amastatin and its analogs such as epiamastatin (aminopeptidase inhibitor); antipain (trypsin inhibitor); antithrombin III (serine protease inhibitor); 4-sulfamoylphenyl-4-guanidinobenzoate methanesulfonate (trypsin inhibitor); camostat (trypsin inhibitor); elafin (elastase inhibitor); hirudin (thrombin-like serine protease inhibitor); cystatin (egg white cysteine protease inhibitor); E-64 (trans-epoxysuccinyl-L-leucylamido-(4-guanidino)-butane) and its analogs (cysteine protease inhibitor); α_2 -macroglobulin (universal endoprotease inhibitor); α_1 -antitrypsin (trypsin inhibitor); pepstatin and its analogs such as acetyl pepstatin, pepstatin A, Nle-Sta-Ala-Sta (aspartyl protease inhibitor); apstatin (aminopeptidase

P inhibitor); (2R)-2-mercaptomethyl-4-methylpentanoyl-b-(2-naphthyl)-Ala-Ala amide (matrix metalloprotease inhibitor); (2R)-2-mercaptomethyl-4-methylpentanoyl-Phe-Ala amide (matrix metalloprotease inhibitor); N-acetyl-Leu-Leu-methioninal (calpain inhibitor); N-acetyl-Leu-Leu-norleucinal (calpain inhibitor); p-aminobenzoyl-Gly-Pro-D-Leu-D-Ala hydroxamic acid (matrix metalloprotease inhibitor); 2(R)-[N-(4-methoxyphenylsulfonyl)-N-(3-pyridylmethyl)amino]-3-methylbutano-hydroxamic acid (metalloprotease inhibitor); 4-(2-aminoethyl)-benzenesulfonylfluoride hydrochloride (broad spectrum/general protease inhibitor); and mixtures of any of the foregoing.

Among preferred protease inhibitors for use in the absorbent articles of the invention are compounds that exhibit inhibitory activity that is not necessarily restricted to a single class of proteases. Such compounds include, but are not limited to, hexamidine and its salts; pentamidine and its salts; benzamidine and its salts and derivatives, p-aminobenzamidine and its salts and derivatives; and guanidinobenzoic acid and its salts and derivatives such as those disclosed in U.S. Pat. No. 5,376,655 issued to Imaki et al. on Dec. 27, 1994, the disclosure of which is hereby incorporated by reference. Other preferred protease inhibitors include polymer derivatives of guanidinobenzoic acid disclosed and made in our co-pending U.S. patent application Ser. No. 09/041,196, filed Mar. 12, 1998 in the name of T. L. Underiner et al, co-filed with the present application, the disclosure of which co-pending application is hereby incorporated by reference.

The protease inhibitors may be employed singly or as a mixture of protease inhibitors such as a "cocktail" of inhibitors in a single absorbent article. Moreover, different protease inhibitors may be employed in different locations in a single absorbent article.

Because of the wide diversity of enzymes present in feces, it is reasonably predictable that materials such as those described above which inhibit fecal proteases may also inhibit enzymes that cleave substrates other than proteins and peptides. Hence protease inhibitors which also inhibit lipases and other esterases, amylases, and/or ureases are within the scope of the embodiments of the invention if the inhibitor meets the IC₅₀ criteria for protease inhibitory activity as described above.

Protease inhibitors that are preferred in the practice of the invention are soybean trypsin inhibitor, Bowman-Birk inhibitor, aprotinin, hexamidine (e.g., hexamidine diisethionate), p-aminobenzamidine, leupeptin, pepstatin A, chymostatin and polymer derivatives of guanidinobenzoic acid (disclosed and made in our copending U.S. patent application Ser. No. 09/041,196, incorporated by reference above. Particularly preferred protease inhibitors are soybean

trypsin inhibitor, hexamidine, p-aminobenzamidine and the foregoing polymer derivatives of guanidinobenzoic.

Vitamins

- 5 Various vitamins may be incorporated into the skin care compositions and lotions, including, but not limited to, Vitamin A and derivatives, Vitamin B derivatives (panthenol, niacinamide), Vitamin C and derivatives, Vitamin D and derivatives, and Vitamin E and derivatives.

Moisturizers/Humectants

- 10 Depending on the skin condition to be treated, humectants may be included in the skin care compositions. Humectant is a type of moisturizing emollient which attracts moisture from the surrounding atmosphere and enhance water absorption of the stratum corneum (i.e., the outer, corny layer of the skin). Nonlimiting examples of humectants useful herein include glycerin; C2-C6 glycols, such as ethylene glycol, propylene glycol, butylene glycol, hexylene glycol; polyethylene glycols (PEGs), such as PEG-2, PEG-3, PEG-30, and PEG-50; polypropylene glycols (PPGs), such as PPG-9, PPG-12, PPG-15, PPG-17, PPG-20, PPG-26, PPG-30, and PPG-34; glycolic esters and ethers, such as C4-C20 alkylether of PEG or PPG, C1-C20 carboxylic acid esters of PEG or PPG, di-C8-C30 alkyl ethers of PEG or PPG; sorbitols and sorbitol esters, trihydroxystearin; polyhydric alcohols; other ethoxylated derivatives of lipids; and the like.

20 Perfumes/Fragrances

- The perfumes and compositions of this invention are the conventional ones known in the art. Selection of any perfume component, or amount of perfume, is based on functional and aesthetic considerations. Preferred perfume components useful in the present invention are the highly volatile, and the moderately volatile perfume ingredients, more preferably the highly volatile, low boiling 25 perfumes.

- The highly volatile, low boiling, perfume ingredients typically have boiling points of about 250° C. or lower. These highly volatile perfumes are fleeting and are quickly lost as they are released. Many of the more moderately volatile perfume ingredients are also quickly lost. The moderately volatile perfume ingredients are those having boiling points of from about 250° C. to about 300° C. Many of 30 the perfume ingredients as discussed hereinafter, along with their odor characters, and their physical and chemical properties, such as boiling point and molecular weight, are given in "Perfume and

Flavor Chemicals (Aroma Chemicals)," Steffen Arctander, published by the author, 1969, incorporated herein by reference.

Examples of the highly volatile, low boiling, perfume ingredients are: anethole, benzaldehyde, benzyl acetate, benzyl alcohol, benzyl formate, iso-bornyl acetate, camphene, cis-citral (neral), citronellal, citronellol, citronellyl acetate, para-cymene, decanal, dihydrolinalool, dihydromyrcenol, dimethyl phenyl carbinol, eucalyptol, geranial, geraniol, geranyl acetate, geranyl nitrile, cis-3-hexenyl acetate, hydroxycitronellal, d-limonene, linalool, linalool oxide, linalyl acetate, linalyl propionate, methyl anthranilate, alpha-methyl ionone, methyl nonyl acetaldehyde, methyl phenyl carbinyl acetate, laevo-menthyl acetate, menthone, iso-menthone, myrcene, myrcenyl acetate, myrcenol, nerol, neryl acetate, nonyl acetate, phenyl ethyl alcohol, alpha-pinene, beta-pinene, gamma-terpinene, alpha-terpineol, beta-terpineol, terpinyl acetate, and vertenex (para-tertiary-butyl cyclohexyl acetate). Some natural oils also contain large percentages of highly volatile perfume ingredients. For example, lavandin contains as major components: linalool; linalyl acetate; geraniol; and citronellol. Lemon oil and orange terpenes both contain about 95% of d-limonene.

Examples of moderately volatile perfume ingredients are: amyl cinnamic aldehyde, iso-amyl salicylate, beta-caryophyllene, cedrene, cinnamic alcohol, coumarin, dimethyl benzyl carbinyl acetate, ethyl vanillin, eugenol, iso-eugenol, flor acetate, heliotropine, 3-cis-hexenyl salicylate, hexyl salicylate, lilial (para-tertiarybutyl-alpha-methyl hydrocinnamic aldehyde), gamma-methyl ionone, nerolidol, patchouli alcohol, phenyl hexanol, beta-selinene, trichloromethyl phenyl carbinyl acetate, triethyl citrate, vanillin, and veratraldehyde. Cedarwood terpenes are composed mainly of alpha-cedrene, beta-cedrene, and other $C_{15}H_{24}$ sesquiterpenes.

Other odor controlling organic compounds which can be used herein include particular other fragrance/masking/reacting components selected from the lists (c), (d) and (e).

Components from list (c) are menthol, menthyl acetate, menthyl lactate, menthyl propionate, menthyl butyrate, menthone, mint terpenes, laevo-carvone, Cis-3-Hexenol & Cis-3-Hexenyl acetate, koavone, methyl dioxolan, ethylene brassylate, and salicylate esters. Salicylate esters are preferably selected from amyl salicylate, isoamyl salicylate, isobutyl salicylate, cis-3-hexenyl salicylate, hexyl salicylate, cyclohexyl salicylate, benzyl salicylate, phenylethyl salicylate, propyl salicylate, isopropyl salicylate or mixtures thereof.

These are all compounds which primary function is to mask malodors. This may occur through vapor pressure suppression of the malodor or by overwhelming the unpleasant malodor with the pleasant odor of the fragrance component. These materials, when used, may significantly reduce

the ability to detect the malodors. The masking ability to hide malodors is possible due to the volatile nature of the materials selected, which are released from the complex in the absorbent article and are then inhaled into the nose of a consumer, generally within somewhat close range of the absorbent article, e.g. within about 0 to 10 meters of the article by normal breathing (although this should in no way be intended to limit the scope of the invention).

Components from list (d) are methyl-dihydrojasmonate, methyl jasmonate, eucalyptol, tetrahydro-linalool, phenyl-ethyl alcohol, hexyl iso-butyrate, linalyl acetate, benzyl acetate, Benzyl alcohol, or mixture thereof. These are volatile materials which are well complexed with cyclodextrin and are released very quickly upon contact with a water based liquid. Their presence allows the absorbent article to respond even more quickly to an insult of malodorant liquid by releasing a compound that have a good general masking effect against malodors, in particular, being very volatile, reduces the vapor pressure of other malodorant compounds slowing down their evaporation rate.

List (e) includes other malodor masking and fragrance components which can be used as odor controlling organic compounds in the present invention:

5 e) camphor, p-menthane, limonene, cresol, linalool, myrcenol, tetra hydromyrcenol, di-hydromyrcenol, myrcene, citronellol, citronellyl derivatives, geraniol, geranyl derivatives, mugetanol, eugenol, jasmal, terpeneol, pinanol, cedrene, damascone, beta pinene, cineole and its
10 derivatives, nonadienol, ethylhexanal, octanol acetate, methyl furfural, terpinene, thujene, amylacetate, camphene, citronellal, hydroxycitronellal, ethyl maltol, methyl phenyl carbinyl acetate, dihydrocumarin, di-hydromyrcenyl acetate, geraniol, geranial, isoamylacetate, ethyl, and/or triethyl acetate, para-cresol, para-cymene, methyl abietate, , hexyl-2-methyl butyrate, hexyl-2-methyl butyrate , and mixtures thereof.

The optional perfume component may comprise a component selected from the group consisting of

- 15 (1) a perfume microcapsule, or a moisture-activated perfume microcapsule, comprising a perfume carrier and an encapsulated perfume composition, wherein said perfume carrier may be selected from the group consisting of cyclodextrins, starch microcapsules, porous carrier microcapsules, and mixtures thereof; and wherein said encapsulated perfume composition may comprise low volatile perfume ingredients, high volatile perfume ingredients, and mixtures thereof;
- (2) a pro-perfume;

(3) a low odor detection threshold perfume ingredients, wherein said low odor detection threshold perfume ingredients may comprise less than about 25%, by weight of the total neat perfume composition; and

(4) mixtures thereof; and

5 Porous Carrier Microcapsule - A portion of the perfume composition can also be absorbed onto and/or into a porous carrier, such as zeolites or clays, to form perfume porous carrier microcapsules in order to reduce the amount of free perfume in the multiple use fabric conditioning composition.

Pro-perfume - The perfume composition may additionally include a pro-perfume. Pro-perfumes may comprise nonvolatile materials that release or convert to a perfume material as a result of, e.g., simple hydrolysis, or may be pH-change-triggered pro-perfumes (e.g. triggered by a pH drop) or may be enzymatically releasable pro-perfumes, or light-triggered pro-perfumes. The pro-perfumes may exhibit varying release rates depending upon the pro-perfume chosen.

15 Skin aesthetics/Skin feel

Silk protein is composed of silk fiber and sericin. The silk protein is produced by species of the *Phylum Arthropoda*, classes *Insecta* and *Arachnida*. Sericin and/or silk amino acids and/or silk peptides are amenable to binding to the skin and hair, forming a resistant, moisturizing, and protective film on the skin/hair. The optional silk ingredient also provides for body benefits such as soothing, moisturizing, and conditioning. The lotion compositions may comprise the preferred optional silk protein or silk amino acids, or mixtures thereof at concentrations ranging from about 0.0001% to about 25% or from about 0.0005% to about 15% or from about 0.001% to about 10% by weight of the lotion.

In one embodiment, the lotion composition may comprise inorganic particles, including alumina silicates, silicates, silicas, mica and/ or talc. Clays may also be used. However, in the present invention it may be preferred that the particulate material is an organic material. Preferably, the particles are a non-active and/ or non-reactive material. The particles may be porous, or non-porous. The particles may have any shape, but preferably they have a smooth surface, and they may be preferably spherical or plate-like particles. The particles may comprise a coating agent on their surface or part thereof, for example a surfactant to change its properties, e.g. hydrophilicity. The particles, in particular when they are oleofinic, may include a melt- additive, which is added during the manufacturing of the particles.

Suitable materials include but are not limited to: polystyrene particles, polypropylene and/or polyethylene (co)polymer particles, polytetrafluoroethylene particles, polymethylsilsesquioxane particles, nylon particles. Suitable commercially available particulate materials include but are not limited to: polyethylene particles, available from Honeywell International of Morristown, NJ under the trade name ACUMIST; polymethyl methacrylate particles (microspheres), available from KOBO of South Plainfield, NJ as BPA; lactone cross polymer particles (microspheres), available from KOBO as BPD; nylon 12 particles (microspheres), available from KOBO as NYLON SP; polymethylsilsesquioxane particles (microspheres), available from KOBO as TOSPEARL; cellulose particles (microspheres), available from KOBO as CELLO-BEADS; polytetrafluoroethylene powders, available from Micro Powders, Inc. of Tarrytown, NY as MICROSLIP; blends of natural wax and micronized polymers as are available from Micro Powders as MICROCARE and particles of a copolymer of vinylidene chloride, acrylonitrile and methylmethacrylate available as EXPANCEL from Expancel, Inc. of Duluth, GA.. Micronized waxes, such as are available from Micro Powders as MICROEASE may also be incorporated. Preferred are polyolefin particles (powders) as are available from Equistar Chemical Corp. Houston, TX as MICROTHENE. Particularly preferred is MICROTHENE FN510-00 from Equistar.

In one aspect, Table 1 Compositions 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10; and Table 2 Compositions 1, 2, 3, 4, 5, 6, 7, 8, and 9 the metathesized unsaturated polyol ester is derived from a natural polyol ester and/or a synthetic polyol ester, in one aspect, said natural polyol ester is selected from the group consisting of a vegetable oil, an animal fat, an algae oil and mixtures thereof; and said synthetic polyol ester is derived from a material selected from the group consisting of ethylene glycol, propylene glycol, glycerol, polyglycerol, polyethylene glycol, polypropylene glycol, poly(tetramethylene ether) glycol, pentaerythritol, dipentaerythritol, tripentaerythritol, trimethylolpropane, neopentyl glycol, a sugar, in one aspect, sucrose, and mixtures thereof.

In one aspect, Table 1 Compositions 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10; and Table 2 Compositions 1, 2, 3, 4, 5, 6, 7, 8, and 9 the metathesized unsaturated polyol ester is selected from the group consisting of metathesized Abyssinian oil, metathesized Almond Oil, metathesized Apricot Oil, metathesized Apricot Kernel oil, metathesized Argan oil, metathesized Avocado Oil, metathesized Babassu Oil, metathesized Baobab Oil, metathesized Black Cumin Oil, metathesized Black Currant Oil, metathesized Borage Oil, metathesized Camelina oil, metathesized Carinata oil, metathesized Canola oil, metathesized Castor oil, metathesized Cherry Kernel Oil, metathesized Coconut oil, metathesized Corn oil, metathesized Cottonseed oil, metathesized Echium Oil,

metathesized Evening Primrose Oil, metathesized Flax Seed Oil, metathesized Grape Seed Oil, metathesized Grapefruit Seed Oil, metathesized Hazelnut Oil, metathesized Hemp Seed Oil, metathesized Jatropa oil, metathesized Jojoba Oil, metathesized Kukui Nut Oil, metathesized Linseed Oil, metathesized Macadamia Nut Oil, metathesized Meadowfoam Seed Oil, metathesized
5 Moringa Oil, metathesized Neem Oil, metathesized Olive Oil, metathesized Palm Oil, metathesized Palm Kernel Oil, metathesized Peach Kernel Oil, metathesized Peanut Oil, metathesized Pecan Oil, metathesized Pennycress oil, metathesized Perilla Seed Oil, metathesized Pistachio Oil, metathesized Pomegranate Seed Oil, metathesized Pongamia oil, metathesized Pumpkin Seed Oil, metathesized Raspberry Oil, metathesized Red Palm Olein, metathesized Rice Bran Oil, metathesized Rosehip
10 Oil, metathesized Safflower Oil, metathesized Seabuckthorn Fruit Oil, metathesized Sesame Seed Oil, metathesized Shea Olein, metathesized Sunflower Oil, metathesized Soybean Oil, metathesized Tonka Bean Oil, metathesized Tung Oil, metathesized Walnut Oil, metathesized Wheat Germ Oil, metathesized High Oleoyl Soybean Oil, metathesized High Oleoyl Sunflower Oil, metathesized High Oleoyl Safflower Oil, metathesized High Erucic Acid Rapeseed Oil, and mixtures thereof.

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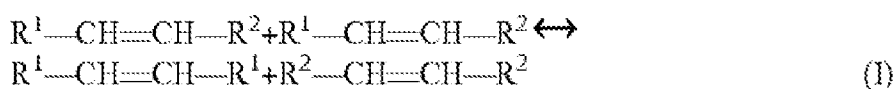
Methods of Making Compositions

The compositions of the present invention can be formulated into any suitable form and prepared by any process chosen by the formulator. For example, the metathesized unsaturated polyol esters can be combined directly with the composition's other ingredients without pre-emulsification
20 and/or pre-mixing to form the finished products. Alternatively, the metathesized unsaturated polyol esters can be combined with surfactants or emulsifiers, solvents, suitable adjuncts, and/or any other suitable ingredients to prepare emulsions prior to compounding the finished products.

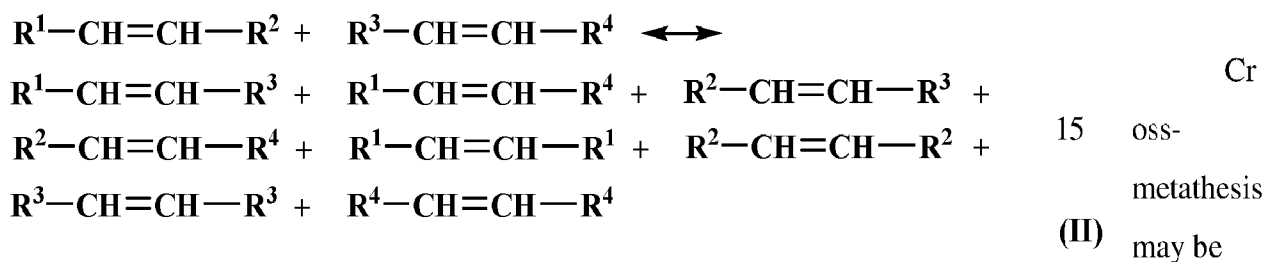
Suitable equipment for use in the processes disclosed herein may include continuous stirred tank reactors, homogenizers, turbine agitators, recirculating pumps, paddle mixers, plough shear
25 mixers, ribbon blenders, vertical axis granulators and drum mixers, both in batch and, where available, in continuous process configurations, spray dryers, and extruders. Such equipment can be obtained from Lodige GmbH (Paderborn, Germany), Littleford Day, Inc. (Florence, Kentucky, U.S.A.), Forberg AS (Larvik, Norway), Glatt Ingenieurtechnik GmbH (Weimar, Germany), Niro (Soeborg, Denmark), Hosokawa Bepex Corp. (Minneapolis, Minnesota, U.S.A.), Arde Barinco
30 (New Jersey, U.S.A.).

Metathesized Unsaturated Polyol Ester

Exemplary metathesized unsaturated polyol esters and their starting materials are set forth in U.S. Patent Applications U.S. 2009/0220443 A1, U.S. 2013/0344012 A1 and US 2014/0357714 A1, which are incorporated herein by reference. A metathesized unsaturated polyol ester refers to the product obtained when one or more unsaturated polyol ester ingredient(s) are subjected to a metathesis reaction. Metathesis is a catalytic reaction that involves the interchange of alkylidene units among compounds containing one or more double bonds (i.e., olefinic compounds) via the formation and cleavage of the carbon-carbon double bonds. Metathesis may occur between two of the same molecules (often referred to as self-metathesis) and/or it may occur between two different molecules (often referred to as cross-metathesis). Self-metathesis may be represented schematically as shown in Equation I.



where R^1 and R^2 are organic groups.



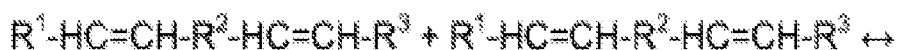
represented schematically as shown in Equation II.

where R^1 , R^2 , R^3 , and R^4 are organic groups.

When a polyol ester comprises molecules having more than one carbon-carbon double bond, self-metathesis may result in oligomerization or polymerization of the unsaturates in the starting material. For example, Equation C depicts metathesis oligomerization of a representative species (e.g., a polyol ester) having more than one carbon-carbon double bond. In Equation C, the self-metathesis reaction results in the formation of metathesis dimers, metathesis trimers, and metathesis tetramers. Although not shown, higher order oligomers such as metathesis pentamers, hexamers, heptamers, octamers, nonamers, decamers, and higher than decamers, and mixtures of two or more thereof, may also be formed. The number of metathesis repeating units or groups in the metathesized natural oil may range from 1 to about 100, or from 2 to about 50, or from 2 to about 30, or from 2 to

about 10, or from 2 to about 4. The molecular weight of the metathesis dimer may be greater than the molecular weight of the unsaturated polyol ester from which the dimer is formed. Each of the bonded polyol ester molecules may be referred to as a "repeating unit or group." Typically, a metathesis trimer may be formed by the cross-metathesis of a metathesis dimer with an unsaturated polyol ester. Typically, a metathesis tetramer may be formed by the cross-metathesis of a metathesis trimer with an unsaturated polyol ester or formed by the cross-metathesis of two metathesis dimers.

Equation C



(metathesis dimer)



+ (other products)

(metathesis trimer)



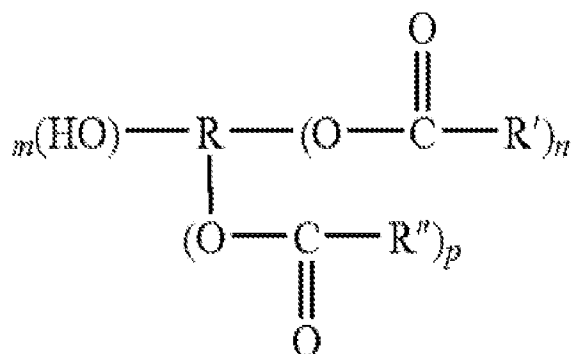
+ (other products)

(metathesis tetramer)

where R^1 , R^2 , and R^3 are organic groups.

As a starting material, metathesized unsaturated polyol esters are prepared from one or more unsaturated polyol esters. As used herein, the term "unsaturated polyol ester" refers to a compound having two or more hydroxyl groups wherein at least one of the hydroxyl groups is in the form of an ester and wherein the ester has an organic group including at least one carbon-carbon double bond. In many embodiments, the unsaturated polyol ester can be represented by the general structure (I):

(I)



where $n \geq 1$;

$m \geq 0$;

$p \geq 0$;

5 $(n+m+p) \geq 2$;

R is an organic group;

R' is an organic group having at least one carbon-carbon double bond; and

R'' is a saturated organic group.

In many embodiments of the invention, the unsaturated polyol ester is an unsaturated polyol
 10 ester of glycerol. Unsaturated polyol esters of glycerol have the general structure (II):



where -X, -Y, and -Z are independently selected from the group consisting of:

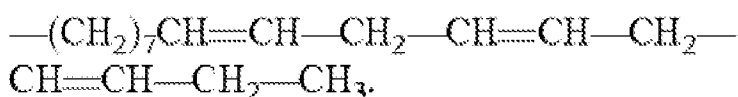
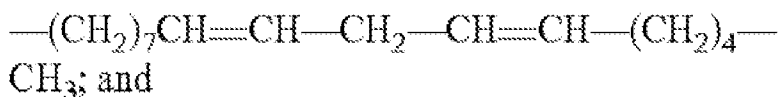
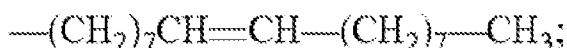
—OH; —(O—C(=O)—R'); and —(O—C(=O)—R'');

15 where -R' is an organic group having at least one carbon-carbon double bond and -R'' is a saturated organic group.

In structure (II), at least one of -X, -Y, and -Z is -(O—C(=O)—R').

In some embodiments, R' is a straight or branched chain hydrocarbon having about 50 or less carbon atoms (e.g., about 36 or less carbon atoms or about 26 or less carbon atoms) and at least one carbon-carbon double bond in its chain. In some embodiments, R' is a straight or branched chain
 20 hydrocarbon having about 6 carbon atoms or greater (e.g., about 10 carbon atoms or greater or about 12 carbon atoms or greater) and at least one carbon-carbon double bond in its chain. In some

embodiments, R' may have two or more carbon-carbon double bonds in its chain. In other embodiments, R' may have three or more double bonds in its chain. In exemplary embodiments, R' has 17 carbon atoms and 1 to 3 carbon-carbon double bonds in its chain. Representative examples of R' include:



5

In some embodiments, R'' is a saturated straight or branched chain hydrocarbon having about 50 or less carbon atoms (e.g., about 36 or less carbon atoms or about 26 or less carbon atoms). In some embodiments, R'' is a saturated straight or branched chain hydrocarbon having about 6 carbon atoms or greater (e.g., about 10 carbon atoms or greater or about 12 carbon atoms or greater).

10 In exemplary embodiments, R'' has 15 carbon atoms or 17 carbon atoms.

Sources of unsaturated polyol esters of glycerol include synthesized oils, natural oils (e.g., vegetable oils, algae oils, bacterial derived oils, and animal fats), combinations of these, and the like. Recycled used vegetable oils may also be used. Representative non-limiting examples of vegetable oils include Abyssinian oil, Almond Oil, Apricot Oil, Apricot Kernel oil, Argan oil, Avocado Oil, Babassu Oil, Baobab Oil, Black Cumin Oil, Black Currant Oil, Borage Oil, Camelina oil, Carinata oil, Canola oil, Castor oil, Cherry Kernel Oil, Coconut oil, Corn oil, Cottonseed oil, Echium Oil, Evening Primrose Oil, Flax Seed Oil, Grape Seed Oil, Grapefruit Seed Oil, Hazelnut Oil, Hemp Seed Oil, Jatropha oil, Jojoba Oil, Kukui Nut Oil, Linseed Oil, Macadamia Nut Oil, Meadowfoam Seed Oil, Moringa Oil, Neem Oil, Olive Oil, Palm Oil, Palm Kernel Oil, Peach Kernel Oil, Peanut Oil, Pecan Oil, Pennycress oil, Perilla Seed Oil, Pistachio Oil, Pomegranate Seed Oil, Pongamia oil, Pumpkin Seed Oil, Raspberry Oil, Red Palm Olein, Rice Bran Oil, Rosehip Oil, Safflower Oil, Seabuckthorn Fruit Oil, Sesame Seed Oil, Shea Olein, Sunflower Oil, Soybean Oil, Tonka Bean Oil, Tung Oil, Walnut Oil, Wheat Germ Oil, High Oleoyl Soybean Oil, High Oleoyl Sunflower Oil, High Oleoyl Safflower Oil, High Erucic Acid Rapeseed Oil, combinations of these, and the like.

25 Representative non-limiting examples of animal fats include lard, tallow, chicken fat, yellow grease, fish oil, emu oil, combinations of these, and the like. A representative non-limiting example of a

synthesized oil includes tall oil, which is a byproduct of wood pulp manufacture. In some embodiments, the natural oil is refined, bleached, and/or deodorized.

Other examples of unsaturated polyol esters include esters such as those derived from ethylene glycol or propylene glycol, polyethylene glycol, polypropylene glycol, or poly(tetramethylene ether) glycol, esters such as those derived from pentaerythritol, dipentaerythritol, tripentaerythritol, trimethylolpropane, or neopentyl glycol, or sugar esters such as SEFOSE®. Sugar esters such as SEFOSE® include one or more types of sucrose polyesters, with up to eight ester groups that could undergo a metathesis exchange reaction. Sucrose polyesters are derived from a natural resource and therefore, the use of sucrose polyesters can result in a positive environmental impact. Sucrose polyesters are polyester materials, having multiple substitution positions around the sucrose backbone coupled with the chain length, saturation, and derivation variables of the fatty chains. Such sucrose polyesters can have an esterification (“IBAR”) of greater than about 5. In one embodiment the sucrose polyester may have an IBAR of from about 5 to about 8. In another embodiment the sucrose polyester has an IBAR of about 5-7, and in another embodiment the sucrose polyester has an IBAR of about 6. In yet another embodiment the sucrose polyester has an IBAR of about 8. As sucrose polyesters are derived from a natural resource, a distribution in the IBAR and chain length may exist. For example a sucrose polyester having an IBAR of 6, may contain a mixture of mostly IBAR of about 6, with some IBAR of about 5 and some IBAR of about 7. Additionally, such sucrose polyesters may have a saturation or iodine value (“IV”) of about 3 to about 140. In another embodiment the sucrose polyester may have an IV of about 10 to about 120. In yet another embodiment the sucrose polyester may have an IV of about 20 to 100. Further, such sucrose polyesters have a chain length of about C₁₂ to C₂₀ but are not limited to these chain lengths.

Non-limiting examples of sucrose polyesters suitable for use include SEFOSE® 1618S, SEFOSE® 1618U, SEFOSE® 1618H, Sefa Soyate IMF 40, Sefa Soyate LP426, SEFOSE® 2275, SEFOSE® C1695, SEFOSE® C18:0 95, SEFOSE® C1495, SEFOSE® 1618H B6, SEFOSE® 1618S B6, SEFOSE® 1618U B6, Sefa Cottonate, SEFOSE® C1295, Sefa C895, Sefa C1095, SEFOSE® 1618S B4.5, all available from The Procter and Gamble Co. of Cincinnati, Ohio.

Other examples of suitable polyol esters may include but not be limited to sorbitol esters, maltitol esters, sorbitan esters, maltodextrin derived esters, xylitol esters, polyglycerol esters, and other sugar derived esters.

Natural oils of the type described herein typically are composed of triglycerides of fatty

acids. These fatty acids may be either saturated, monounsaturated or polyunsaturated and contain varying chain lengths ranging from C₈ to C₃₀. The most common fatty acids include saturated fatty acids such as lauric acid (dodecanoic acid), myristic acid (tetradecanoic acid), palmitic acid (hexadecanoic acid), stearic acid (octadecanoic acid), arachidic acid (eicosanoic acid), and lignoceric acid (tetracosanoic acid); unsaturated acids include such fatty acids as palmitoleic (a C₁₆ acid), and oleic acid (a C₁₈ acid); polyunsaturated acids include such fatty acids as linoleic acid (a di-unsaturated C₁₈ acid), linolenic acid (a tri-unsaturated C₁₈ acid), and arachidonic acid (a tetra-unsaturated C₂₀ acid). The natural oils are further comprised of esters of these fatty acids in random placement onto the three sites of the trifunctional glycerine molecule. Different natural oils will have different ratios of these fatty acids, and within a given natural oil there is a range of these acids as well depending on such factors as where a vegetable or crop is grown, maturity of the vegetable or crop, the weather during the growing season, etc. Thus, it is difficult to have a specific or unique structure for any given natural oil, but rather a structure is typically based on some statistical average. For example soybean oil contains a mixture of stearic acid, oleic acid, linoleic acid, and linolenic acid in the ratio of 15:24:50: 11, and an average number of double bonds of 4.4-4.7 per triglyceride. One method of quantifying the number of double bonds is the iodine value (IV) which is defined as the number of grams of iodine that will react with 100 grams of oil. Therefore for soybean oil, the average iodine value range is from 120-140. Soybean oil may comprises about 95% by weight or greater (e.g., 99% weight or greater) triglycerides of fatty acids. Major fatty acids in the polyol esters of soybean oil include saturated fatty acids, as a non-limiting example, palmitic acid (hexadecanoic acid) and stearic acid (octadecanoic acid), and unsaturated fatty acids, as a non-limiting example, oleic acid (9-octadecenoic acid), linoleic acid (9,12-octadecadienoic acid), and linolenic acid (9,12,15-octadecatrienoic acid).

In an exemplary embodiment, the vegetable oil is canola oil, for example, refined, bleached, and deodorized canola oil (i.e., RBD canola oil). Canola oil is an unsaturated polyol ester of glycerol that typically comprises about 95% weight or greater (e.g., 99% weight or greater) triglycerides of fatty acids. Major fatty acids in the polyol esters of canola oil include saturated fatty acids, for example, palmitic acid (hexadecanoic acid) and stearic acid (octadecanoic acid), and unsaturated fatty acids, for example, oleic acid (9-octadecenoic acid), linoleic acid (9,12-octadecadienoic acid), and linolenic acid (9,12,15-octadecatrienoic acid). Canola oil is a highly unsaturated vegetable oil with many of the triglyceride molecules having at least two unsaturated fatty acids (i.e., a polyunsaturated triglyceride).

In exemplary embodiments, an unsaturated polyol ester is self-metathesized in the presence of a metathesis catalyst to form a metathesized composition. Typically, after metathesis has occurred, the metathesis catalyst is removed from the resulting product. One method of removing the catalyst is treatment of the metathesized product with clay. In many embodiments, the metathesized composition comprises one or more of: metathesis monomers, metathesis dimers, metathesis trimers, metathesis tetramers, metathesis pentamers, and higher order metathesis oligomers (e.g., metathesis hexamers). A metathesis dimer refers to a compound formed when two unsaturated polyol ester molecules are covalently bonded to one another by a self-metathesis reaction. In many embodiments, the molecular weight of the metathesis dimer is greater than the molecular weight of the individual unsaturated polyol ester molecules from which the dimer is formed. A metathesis trimer refers to a compound formed when three unsaturated polyol ester molecules are covalently bonded together by metathesis reactions. In many embodiments, a metathesis trimer is formed by the cross-metathesis of a metathesis dimer with an unsaturated polyol ester. A metathesis tetramer refers to a compound formed when four unsaturated polyol ester molecules are covalently bonded together by metathesis reactions. In many embodiments, a metathesis tetramer is formed by the cross-metathesis of a metathesis trimer with an unsaturated polyol ester. Metathesis tetramers may also be formed, for example, by the cross-metathesis of two metathesis dimers. Higher order metathesis products may also be formed. For example, metathesis pentamers and metathesis hexamers may also be formed. The self-metathesis reaction also results in the formation of internal olefin compounds that may be linear or cyclic. If the metathesized polyol ester is fully or partially hydrogenated, the linear and cyclic olefins would typically be fully or partially converted to the corresponding saturated linear and cyclic hydrocarbons. The linear/cyclic olefins and saturated linear/cyclic hydrocarbons may remain in the metathesized polyol ester or they may be removed or partially removed from the metathesized polyol ester using one or more known stripping techniques, including but not limited to wipe film evaporation, falling film evaporation, rotary evaporation, steam stripping, vacuum distillation, etc.

In some embodiments, the unsaturated polyol ester is partially hydrogenated before being metathesized. For example, in some embodiments, the unsaturated polyol ester is partially hydrogenated to achieve an iodine value (IV) of about 120 or less before subjecting the partially hydrogenated polyol ester to metathesis.

In some embodiments, the unsaturated polyol ester may be hydrogenated (e.g., fully or partially hydrogenated) in order to improve the stability of the oil or to modify its viscosity or other

properties. Representative techniques for hydrogenating unsaturated polyol esters are known in the art and are discussed herein.

In some embodiments, the natural oil is winterized. Winterization refers to the process of: (1) removing waxes and other non-triglyceride constituents, (2) removing naturally occurring high-melting triglycerides, and (3) removing high-melting triglycerides formed during partial hydrogenation. Winterization may be accomplished by known methods including, for example, cooling the oil at a controlled rate in order to cause crystallization of the higher melting components that are to be removed from the oil. The crystallized high melting components are then removed from the oil by filtration resulting in winterized oil. Winterized soybean oil is commercially available from Cargill, Incorporated (Minneapolis, Minn.).

In other embodiments, the metathesized unsaturated polyol esters can be used as a blend with one or more fabric care benefit agents and/or fabric softening actives.

Method of Making Metathesized Unsaturated Polyol Ester

The self-metathesis of unsaturated polyol esters is typically conducted in the presence of a catalytically effective amount of a metathesis catalyst. The term "metathesis catalyst" includes any catalyst or catalyst system that catalyzes a metathesis reaction. Any known or future-developed metathesis catalyst may be used, alone or in combination with one or more additional catalysts. Suitable homogeneous metathesis catalysts include combinations of a transition metal halide or oxo-halide (e.g., WOCl_4 or WCl_6) with an alkylating cocatalyst (e.g., Me_4Sn), or alkylidene (or carbene) complexes of transition metals, particularly Ru or W. These include first and second-generation Grubbs catalysts, Grubbs-Hoveyda catalysts, and the like. Suitable alkylidene catalysts have the

general structure:

$$\text{M}[\text{X}^1\text{X}^2\text{L}^1\text{L}^2(\text{L}^3)_n]=\text{C}_m=\text{C}(\text{R}^1)\text{R}^2$$

where M is a Group 8 transition metal, L^1 , L^2 , and L^3 are neutral electron donor ligands, n is 0 (such that L^3 may not be present) or 1, m is 0, 1, or 2, X^1 and X^2 are anionic ligands, and R^1 and R^2 are independently selected from H, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, and functional groups. Any two or more of X^1 , X^2 , L^1 , L^2 , L^3 , R^1 and R^2 can form a cyclic group and any one of those groups can be attached to a support.

First-generation Grubbs catalysts fall into this category where $m=n=0$ and particular selections are made for n, X^1 , X^2 , L^1 , L^2 , L^3 , R^1 and R^2 as described in U.S. Pat. Appl. Publ. No. 2010/0145086, the teachings of which related to all metathesis catalysts are incorporated herein by

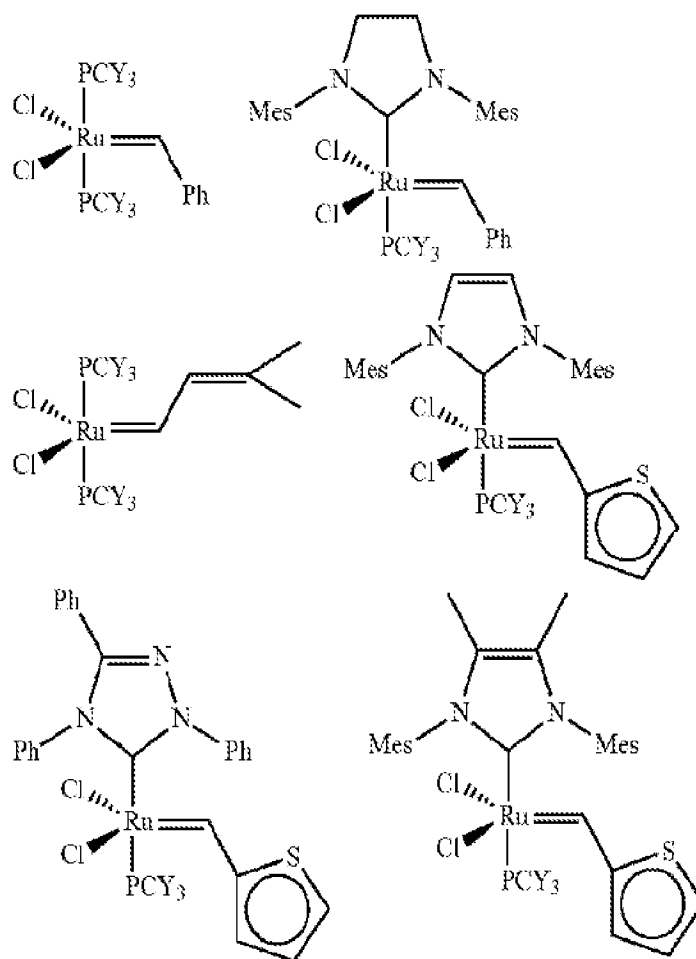
reference.

Second-generation Grubbs catalysts also have the general formula described above, but L^1 is a carbene ligand where the carbene carbon is flanked by N, O, S, or P atoms, preferably by two N atoms. Usually, the carbene ligand is part of a cyclic group. Examples of suitable second-generation Grubbs catalysts also appear in the '086 publication.

In another class of suitable alkylidene catalysts, L^1 is a strongly coordinating neutral electron donor as in first- and second-generation Grubbs catalysts, and L^2 and L^3 are weakly coordinating neutral electron donor ligands in the form of optionally substituted heterocyclic groups. Thus, L^2 and L^3 are pyridine, pyrimidine, pyrrole, quinoline, thiophene, or the like.

In yet another class of suitable alkylidene catalysts, a pair of substituents is used to form a bi- or tridentate ligand, such as a biphosphine, dialkoxide, or alkyldiketonate. Grubbs-Hoveyda catalysts are a subset of this type of catalyst in which L^2 and R^2 are linked. Typically, a neutral oxygen or nitrogen coordinates to the metal while also being bonded to a carbon that is α -, β -, or γ - with respect to the carbene carbon to provide the bidentate ligand. Examples of suitable Grubbs-Hoveyda catalysts appear in the '086 publication.

The structures below provide just a few illustrations of suitable catalysts that may be used:



An immobilized catalyst can be used for the metathesis process. An immobilized catalyst is a system comprising a catalyst and a support, the catalyst associated with the support. Exemplary associations between the catalyst and the support may occur by way of chemical bonds or weak interactions (e.g. hydrogen bonds, donor acceptor interactions) between the catalyst, or any portions thereof, and the support or any portions thereof. Support is intended to include any material suitable to support the catalyst. Typically, immobilized catalysts are solid phase catalysts that act on liquid or gas phase reactants and products. Exemplary supports are polymers, silica or alumina. Such an immobilized catalyst may be used in a flow process. An immobilized catalyst can simplify purification of products and recovery of the catalyst so that recycling the catalyst may be more convenient.

In certain embodiments, prior to the metathesis reaction, the unsaturated polyol ester feedstock may be treated to render the natural oil more suitable for the subsequent metathesis reaction. In one embodiment, the treatment of the unsaturated polyol ester involves the removal of catalyst poisons, such as peroxides, which may potentially diminish the activity of the metathesis

catalyst. Non-limiting examples of unsaturated polyol ester feedstock treatment methods to diminish catalyst poisons include those described in PCT/US2008/09604, PCT/US2008/09635, and U.S. patent application Ser. Nos. 12/672,651 and 12/672,652, herein incorporated by reference in their entireties. In certain embodiments, the unsaturated polyol ester feedstock is thermally treated by heating the feedstock to a temperature greater than 100° C. in the absence of oxygen and held at the temperature for a time sufficient to diminish catalyst poisons in the feedstock. In other embodiments, the temperature is between approximately 100° C. and 300° C., between approximately 120° C. and 250° C., between approximately 150° C. and 210° C., or approximately between 190 and 200° C. In one embodiment, the absence of oxygen is achieved by sparging the unsaturated polyol ester feedstock with nitrogen, wherein the nitrogen gas is pumped into the feedstock treatment vessel at a pressure of approximately 10 atm (150 psig).

In certain embodiments, the unsaturated polyol ester feedstock is chemically treated under conditions sufficient to diminish the catalyst poisons in the feedstock through a chemical reaction of the catalyst poisons. In certain embodiments, the feedstock is treated with a reducing agent or a cation-inorganic base composition. Non-limiting examples of reducing agents include bisulfate, borohydride, phosphine, thiosulfate, and combinations thereof.

In certain embodiments, the unsaturated polyol ester feedstock is treated with an adsorbent to remove catalyst poisons. In one embodiment, the feedstock is treated with a combination of thermal and adsorbent methods. In another embodiment, the feedstock is treated with a combination of chemical and adsorbent methods. In another embodiment, the treatment involves a partial hydrogenation treatment to modify the unsaturated polyol ester feedstock's reactivity with the metathesis catalyst. Additional non-limiting examples of feedstock treatment are also described below when discussing the various metathesis catalysts.

In certain embodiments, a ligand may be added to the metathesis reaction mixture. In many embodiments using a ligand, the ligand is selected to be a molecule that stabilizes the catalyst, and may thus provide an increased turnover number for the catalyst. In some cases the ligand can alter reaction selectivity and product distribution. Examples of ligands that can be used include Lewis base ligands, such as, without limitation, trialkylphosphines, for example tricyclohexylphosphine and tributyl phosphine; triarylphosphines, such as triphenylphosphine; diarylalkylphosphines, such as, diphenylcyclohexylphosphine; pyridines, such as 2,6-dimethylpyridine, 2,4,6-trimethylpyridine; as well as other Lewis basic ligands, such as phosphine oxides and phosphinites. Additives may also be present during metathesis that increase catalyst lifetime.

Any useful amount of the selected metathesis catalyst can be used in the process. For example, the molar ratio of the unsaturated polyol ester to catalyst may range from about 5:1 to about 10,000,000:1 or from about 50:1 to 500,000:1. In some embodiments, an amount of about 1 to about 10 ppm, or about 2 ppm to about 5 ppm, of the metathesis catalyst per double bond of the starting composition (i.e., on a mole/mole basis) is used.

In some embodiments, the metathesis reaction is catalyzed by a system containing both a transition and a non-transition metal component. The most active and largest number of catalyst systems are derived from Group VI A transition metals, for example, tungsten and molybdenum.

Multiple, sequential metathesis reaction steps may be employed. For example, the metathesized unsaturated polyol ester product may be made by reacting an unsaturated polyol ester in the presence of a metathesis catalyst to form a first metathesized unsaturated polyol ester product. The first metathesized unsaturated polyol ester product may then be reacted in a self-metathesis reaction to form another metathesized unsaturated polyol ester product. Alternatively, the first metathesized unsaturated polyol ester product may be reacted in a cross-metathesis reaction with an unsaturated polyol ester to form another metathesized unsaturated polyol ester product. Also in the alternative, the transesterified products, the olefins and/or esters may be further metathesized in the presence of a metathesis catalyst. Such multiple and/or sequential metathesis reactions can be performed as many times as needed, and at least one or more times, depending on the processing/compositional requirements as understood by a person skilled in the art. As used herein, "metathesized unsaturated polyol ester product" may include products that have been once metathesized and/or multiply metathesized. These procedures may be used to form metathesis dimers, metathesis trimers, metathesis tetramers, metathesis pentamers, and higher order metathesis oligomers (e.g., metathesis hexamers, metathesis heptamers, metathesis octamers, metathesis nonamers, metathesis decamers, and higher than metathesis decamers). These procedures can be repeated as many times as desired (for example, from 2 to about 50 times, or from 2 to about 30 times, or from 2 to about 10 times, or from 2 to about 5 times, or from 2 to about 4 times, or 2 or 3 times) to provide the desired metathesis oligomer or polymer which may comprise, for example, from 2 to about 100 bonded groups, or from 2 to about 50, or from 2 to about 30, or from 2 to about 10, or from 2 to about 8, or from 2 to about 6 bonded groups, or from 2 to about 4 bonded groups, or from 2 to about 3 bonded groups. In certain embodiments, it may be desirable to use the metathesized unsaturated polyol ester products produced by cross metathesis of an unsaturated polyol ester, or blend of unsaturated polyol esters, with a C2-C100 olefin, as the reactant in a self-

metathesis reaction to produce another metathesized unsaturated polyol ester product. Alternatively, metathesized products produced by cross metathesis of an unsaturated polyol ester, or blend of unsaturated polyol esters, with a C2-C100 olefin can be combined with an unsaturated polyol ester, or blend of unsaturated polyol esters, and further metathesized to produce another metathesized unsaturated polyol ester product.

The metathesis process can be conducted under any conditions adequate to produce the desired metathesis products. For example, stoichiometry, atmosphere, solvent, temperature, and pressure can be selected by one skilled in the art to produce a desired product and to minimize undesirable byproducts. The metathesis process may be conducted under an inert atmosphere. Similarly, if a reagent is supplied as a gas, an inert gaseous diluent can be used. The inert atmosphere or inert gaseous diluent typically is an inert gas, meaning that the gas does not interact with the metathesis catalyst to substantially impede catalysis. For example, particular inert gases are selected from the group consisting of helium, neon, argon, nitrogen, individually or in combinations thereof.

In certain embodiments, the metathesis catalyst is dissolved in a solvent prior to conducting the metathesis reaction. In certain embodiments, the solvent chosen may be selected to be substantially inert with respect to the metathesis catalyst. For example, substantially inert solvents include, without limitation, aromatic hydrocarbons, such as benzene, toluene, xylenes, etc.; halogenated aromatic hydrocarbons, such as chlorobenzene and dichlorobenzene; aliphatic solvents, including pentane, hexane, heptane, cyclohexane, etc.; and chlorinated alkanes, such as dichloromethane, chloroform, dichloroethane, etc. In one particular embodiment, the solvent comprises toluene. The metathesis reaction temperature may be a rate-controlling variable where the temperature is selected to provide a desired product at an acceptable rate. In certain embodiments, the metathesis reaction temperature is greater than about -40°C ., greater than about -20°C ., greater than about 0°C ., or greater than about 10°C . In certain embodiments, the metathesis reaction temperature is less than about 150°C ., or less than about 120°C . In one embodiment, the metathesis reaction temperature is between about 10°C . and about 120°C .

The metathesis reaction can be run under any desired pressure. Typically, it will be desirable to maintain a total pressure that is high enough to keep the cross-metathesis reagent in solution. Therefore, as the molecular weight of the cross-metathesis reagent increases, the lower pressure range typically decreases since the boiling point of the cross-metathesis reagent increases. The total pressure may be selected to be greater than about 0.1 atm (10 kPa), in some embodiments greater

than about 0.3 atm (30 kPa), or greater than about 1 atm (100 kPa). Typically, the reaction pressure is no more than about 70 atm (7000 kPa), in some embodiments no more than about 30 atm (3000 kPa). A non-limiting exemplary pressure range for the metathesis reaction is from about 1 atm (100 kPa) to about 30 atm (3000 kPa). In certain embodiments it may be desirable to run the metathesis reactions under an atmosphere of reduced pressure. Conditions of reduced pressure or vacuum may be used to remove olefins as they are generated in a metathesis reaction, thereby driving the metathesis equilibrium towards the formation of less volatile products. In the case of a self-metathesis of a natural oil, reduced pressure can be used to remove C₁₂ or lighter olefins including, but not limited to, hexene, nonene, and dodecene, as well as byproducts including, but not limited to cyclohexa-diene and benzene as the metathesis reaction proceeds. The removal of these species can be used as a means to drive the reaction towards the formation of diester groups and cross linked triglycerides.

Hydrogenation:

In some embodiments, the unsaturated polyol ester is partially hydrogenated before it is subjected to the metathesis reaction. Partial hydrogenation of the unsaturated polyol ester reduces the number of double bonds that are available for in the subsequent metathesis reaction. In some embodiments, the unsaturated polyol ester is metathesized to form a metathesized unsaturated polyol ester, and the metathesized unsaturated polyol ester is then hydrogenated (e.g., partially or fully hydrogenated) to form a hydrogenated metathesized unsaturated polyol ester.

Hydrogenation may be conducted according to any known method for hydrogenating double bond-containing compounds such as vegetable oils. In some embodiments, the unsaturated polyol ester or metathesized unsaturated polyol ester is hydrogenated in the presence of a nickel catalyst that has been chemically reduced with hydrogen to an active state. Commercial examples of supported nickel hydrogenation catalysts include those available under the trade designations "NYSOFACT", "NYSOSEL", and "NI 5248 D" (from Englehard Corporation, Iselin, N.H.). Additional supported nickel hydrogenation catalysts include those commercially available under the trade designations "PRICAT 9910", "PRICAT 9920", "PRICAT 9908", "PRICAT 9936" (from Johnson Matthey Catalysts, Ward Hill, Mass.).

In some embodiments, the hydrogenation catalyst comprising, for example, nickel, copper, palladium, platinum, molybdenum, iron, ruthenium, osmium, rhodium, or iridium. Combinations of metals may also be used. Useful catalyst may be heterogeneous or homogeneous. In some embodiments, the catalysts are supported nickel or sponge nickel type catalysts.

In some embodiments, the hydrogenation catalyst comprises nickel that has been chemically reduced with hydrogen to an active state (i.e., reduced nickel) provided on a support. In some embodiments, the support comprises porous silica (e.g., kieselguhr, infusorial, diatomaceous, or siliceous earth) or alumina. The catalysts are characterized by a high nickel surface area per gram of nickel.

In some embodiments, the particles of supported nickel catalyst are dispersed in a protective medium comprising hardened triacylglyceride, edible oil, or tallow. In an exemplary embodiment, the supported nickel catalyst is dispersed in the protective medium at a level of about 22 wt. % nickel.

Hydrogenation may be carried out in a batch or in a continuous process and may be partial hydrogenation or complete hydrogenation. In a representative batch process, a vacuum is pulled on the headspace of a stirred reaction vessel and the reaction vessel is charged with the material to be hydrogenated (e.g., RBD soybean oil or metathesized RBD soybean oil). The material is then heated to a desired temperature. Typically, the temperature ranges from about 50 deg. C. to 350 deg. C., for example, about 100 deg. C. to 300 deg. C. or about 150 deg. C. to 250 deg. C. The desired temperature may vary, for example, with hydrogen gas pressure. Typically, a higher gas pressure will require a lower temperature. In a separate container, the hydrogenation catalyst is weighed into a mixing vessel and is slurried in a small amount of the material to be hydrogenated (e.g., RBD soybean oil or metathesized RBD soybean oil). When the material to be hydrogenated reaches the desired temperature, the slurry of hydrogenation catalyst is added to the reaction vessel. Hydrogen gas is then pumped into the reaction vessel to achieve a desired pressure of H₂ gas. Typically, the H₂ gas pressure ranges from about 15 to 3000 psig, for example, about 15 psig to 90 psig. As the gas pressure increases, more specialized high-pressure processing equipment may be required. Under these conditions the hydrogenation reaction begins and the temperature is allowed to increase to the desired hydrogenation temperature (e.g., about 120 deg. C. to 200 deg. C.) where it is maintained by cooling the reaction mass, for example, with cooling coils. When the desired degree of hydrogenation is reached, the reaction mass is cooled to the desired filtration temperature.

The amount of hydrogenation catalysts is typically selected in view of a number of factors including, for example, the type of hydrogenation catalyst used, the amount of hydrogenation catalyst used, the degree of unsaturation in the material to be hydrogenated, the desired rate of hydrogenation, the desired degree of hydrogenation (e.g., as measure by iodine value (IV)), the purity of the reagent, and the H₂ gas pressure. In some embodiments, the hydrogenation catalyst is

used in an amount of about 10 wt. % or less, for example, about 5 wt. % or less or about 1 wt. % or less.

After hydrogenation, the hydrogenation catalyst may be removed from the hydrogenated product using known techniques, for example, by filtration. In some embodiments, the hydrogenation catalyst is removed using a plate and frame filter such as those commercially available from Sparkler Filters, Inc., Conroe Tex. In some embodiments, the filtration is performed with the assistance of pressure or a vacuum. In order to improve filtering performance, a filter aid may be used. A filter aid may be added to the metathesized product directly or it may be applied to the filter. Representative examples of filtering aids include diatomaceous earth, silica, alumina, and carbon. Typically, the filtering aid is used in an amount of about 10 wt. % or less, for example, about 5 wt. % or less or about 1 wt. % or less. Other filtering techniques and filtering aids may also be employed to remove the used hydrogenation catalyst. In other embodiments the hydrogenation catalyst is removed using centrifugation followed by decantation of the product.

TEST METHODS

Molecular Weight Distribution

The weight average molecular weight (M_w) is measured using gel permeation chromatography (GPC) and multi-angle laser light scattering (MALLS). The GPC/MALLS system used for the analysis is comprised of a Waters Alliance e2695 Separations Module, a Waters 2414 interferometric refractometer, and a Wyatt Heleos II 18 angle laser light scattering detector. The column set used for separation is purchased from TOSOH Biosciences LLC, King of Prussia, PA and included: Guard Column TSKgel G1000Hx-GMHx1-L (Cat # 07113), TSKgel G3000Hx1 (Cat # 0016136), TSKgel G2500Hx1 (Cat # 0016135), and TSKgel G2000Hx1 (Cat # 0016134). Wyatt ASTRA 6 software was used for instrument operation and data analysis. The 90 degree light scattering detection angle is calibrated using filtered, anhydrous toluene. The remaining detection angles are normalized using an isotropic scatterer in THF. To verify instrument performance of the MALLS and RI (refractive index) detectors, a poly(styrene) standard with a known M_w and known dn/dc (in the mobile phase) is run. Acceptable performance of the MALLS and RI detectors gives a calculated M_w within 5% of the reported M_w of the poly(styrene) standard and a mass recovery between 95 and 105%.

To complete the GPC/MALLS analysis, a value of dn/dc is needed. The value of dn/dc is measured as follows. The RI detector is thermostated to 35 degrees Celsius. A series of five

concentration standards of the metathesized unsaturated polyol ester in THF is prepared in the range 0.5 mg/ml to 5.5 mg/ml. A THF blank is injected directly into the refractive index detector, followed by each of the metathesized unsaturated polyol ester concentration standards, and ending with another THF blank. The volume of each sample injected is large enough to obtain a flat plateau
5 region of constant differential refractive index versus time; a value of 1.0 ml is typically used. In the ASTRA software, a baseline is constructed from the initial and final THF injections. For each sample, peak limits are defined and the concentrations entered to calculate dn/dc in the ASTRA software. For the metathesized canola oil of Example 2 in THF, a dn/dc value of 0.072 ml/g is obtained.

10 For the GPC/MALLS analysis of a metathesized unsaturated polyol ester, a total of three samples are evaluated: the metathesized unsaturated polyol ester, a non-metathesized unsaturated polyol ester (glycerol trioleate [122-32-7], Sigma-Aldrich, Milwaukee, WI), and a representative olefin (1-octadecene, [112-88-9], Sigma-Aldrich, Milwaukee, WI). The GPC samples are dissolved in tetrahydrofuran (THF). Concentrations for the metathesized unsaturated polyol ester are
15 approximately 20 mg/ml, and concentrations for the non-metathesized unsaturated polyol ester and olefin are approximately 5 mg/ml. After all the material is dissolved, each solution is filtered by a 0.45 micron nylon filter disk into a GPC autosampler vial for analysis. The GPC column temperature is at room temperature, approximately 25 degrees Celsius. HPLC grade THF is used as the mobile phase and is delivered at a constant flow rate of 1.0 ml/min. The injection volume is 100 microliters
20 and the run time is 40 minutes. Baselines are constructed for all signals. Peak elution limits include metathesized unsaturated polyol ester and non-metathesized unsaturated polyol ester, but exclude later eluting residual olefin. The retention times of the non-metathesized unsaturated polyol ester and olefin were determined from the separate injection runs of both the non-metathesized unsaturated polyol ester and olefin. Baselines and scattering detectors are reviewed.

25 Oligomer Index

The oligomer index of the metathesized unsaturated polyol ester is calculated from data that is determined by Supercritical Fluid Chromatography-Fourier Transform Orbital Trapping Mass Spectrometry (SFC-Orbitrap MS). The sample to be analyzed is typically dissolved in methylene chloride or a methylene chloride - hexane mixture at a concentration of 1000 ppm (1 mg/mL). A
30 further 25x-100x dilution is typically made into hexane (for a final concentration of 10-40 ppm). A volume of 2-7.5 μ L is typically injected on to a SFC column (for example, a commercially available 3 mm i.d. x 150 mm Ethylpyridine column, 3 μ M particle size).

During the chromatography run, the mobile phase is typically programmed from 100% carbon dioxide with a gradient of one percent per minute methanol. The effluent from the column is directed to a mixing tee where an ionization solution is added. The ionization medium is typically 20 mM ammonium formate in methanol at a flow of 0.7 mL/min while the SFC flow is typically 1.6 mL/min into the tee. The effluent from the mixing tee enters the ionization source of the Orbitrap Mass Spectrometer, which is operated in the heated electrospray ionization mode at 320 °C.

In one aspect, a hybrid linear ion trap - Orbitrap mass spectrometer (i.e., the Orbitrap Elite from Thermoelectron Corp.) is calibrated and tuned according to the manufacturer's guidelines. A mass resolution ($m/\Delta m$ peak width at half height) from 100,000 to 250,000 is typically used. C,H,O compositions of eluting species (typically associated with various cations, e.g., NH_4^+ , H^+ , Na^+) are obtained by accurate mass measurement (0.1-2 ppm) and are correlated to metathesis products. Also, sub-structures may be probed by linear ion trap "MSⁿ" experiments with subsequent accurate-mass analysis in the Orbitrap, as practiced typically in the art.

The metathesis monomers, dimers, trimers, tetramers, pentamers, and higher order oligomers are fully separated by SFC. The chromatogram based on ion current from the Orbitrap MS may be integrated, as typically practiced in the art, for each of the particular oligomer groups including metathesis monomers, metathesis dimers, metathesis trimers, metathesis pentamers, and each of the higher order oligomers. These raw areas may then be formulated into various relative expressions, based on normalization to 100%. The sum of the areas of metathesis trimers through the highest oligomer detected is divided by the sum of all metathesis species detected (metathesis monomers to the highest oligomer detected). This ratio is called the oligomer index. As used herein, the "oligomer index" is a relative measure of the fraction of the metathesized unsaturated polyol ester which is comprised of trimers, tetramers, pentamers, and higher order oligomers.

Iodine Value

Another aspect of the invention provides a method to measure the iodine value of the metathesized unsaturated polyol ester. The iodine value is determined using AOCS Official Method Cd 1-25 with the following modifications: carbon tetrachloride solvent is replaced with chloroform (25ml), an accuracy check sample (oleic acid 99%, Sigma-Aldrich; IV = 89.86 ± 2.00 cg/g) is added to the sample set, and the reported IV is corrected for minor contribution from olefins identified when determining the free hydrocarbon content of the metathesized unsaturated polyol ester.

Free Hydrocarbon Content

Another aspect of this invention provides a method to determine the free hydrocarbon content of the metathesized unsaturated polyol ester. The method combines gas chromatography / mass spectroscopy (GC/MS) to confirm identity of the free hydrocarbon homologs and gas chromatography with flame ionization detection (GC/FID) to quantify the free hydrocarbon present.

5 Sample Prep: The sample to be analyzed was typically trans-esterified by diluting (e.g. 400:1) in methanolic KOH (e.g. 0.1N) and heating in a closed container until the reaction was complete (i.e. 90°C for 30 min.) then cooled to room temperature. The sample solution could then be treated with 15% boron tri-fluoride in methanol and again heated in a closed vessel until the reaction was complete (i.e. at 60°C for 30 min.) both to acidify (methyl orange - red) and to methylate any
10 free acid present in the sample. After allowing to cool to room temperature, the reaction was quenched by addition of saturated NaCl in water. An organic extraction solvent such as cyclohexane containing a known level internal standard (e.g. 150ppm dimethyl adipate) was then added to the vial and mixed well. After the layers separated, a portion of the organic phase was transferred to a vial suitable for injection to the gas chromatograph. This sample extraction solution was analyzed by
15 GC/MS to confirm identification of peaks matching hydrocarbon retention times by comparing to reference spectra and then by GC/FID to calculate concentration of hydrocarbons by comparison to standard FID response factors.

A hydrocarbon standard of known concentrations, such as 50ppm each, of typically observed hydrocarbon compounds (i.e. 1-dodecene, 1-tridecene, 1-tetradecene, 1-pentadecene, 1-hexadecene,
20 1-heptadecene, 1-octadecene, dodecane, tridecane, tetradecane, pentadecane, hexadecane, heptadecane and octadecane) was prepared by dilution in the same solvent containing internal standard as was used to extract the sample reaction mixture. This hydrocarbon standard was analyzed by GC/MS to generate retention times and reference spectra and then by GC/FID to generate retention times and response factors.

25 GC/MS: An Agilent 7890 GC equipped with a split/splitless injection port coupled with a Waters QuattroMicroGC mass spectrometer set up in EI+ ionization mode was used to carry out qualitative identification of peaks observed. A non-polar DB1-HT column (15m x 0.25mm x 0.1um df) was installed with 1.4mL/min helium carrier gas. In separate runs, 1uL of the hydrocarbon standard and sample extract solution were injected to a 300° injection port with a split ratio of 25:1.
30 The oven was held at 40°C for 1 minute then ramped 15C°/minute to a final temperature of 325°C which was held for 10 minutes resulting in a total run time of 30 minutes. The transfer line was kept

at 330°C and the temperature of the EI source was 230°C. The ionization energy was set at 70eV and the scan range was 35-550m/z.

GC/FID: An Agilent 7890 GC equipped with a split/splitless injection port and a flame ionization detector was used for quantitative analyses. A non-polar DB1-HT column (5m x 0.25mm x 0.1um df) was installed with 1.4mL/min helium carrier gas. In separate runs, 1uL of the hydrocarbon standard and sample extract solution was injected to a 330° injection port with a split ratio of 100:1. The oven was held at 40°C for 0.5 minutes then ramped at 40C°/minute to a final temperature of 380°C which was held for 3 minutes resulting in a total run time of 12 minutes. The FID was kept at 380°C with 40mL/minute hydrogen gas flow and 450mL/min air flow. Make up gas was helium at 25mL/min. The hydrocarbon standard was used to create a calibration table in the Chemstation Data Analysis software including known concentrations to generate response factors. These response factors were applied to the corresponding peaks in the sample chromatogram to calculate total amount of free hydrocarbon found in each sample.

EXAMPLES

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

Non-limiting examples of product formulations disclosed in the present specification are summarized below.

Example 1: Synthesis of metathesized canola oil

Prior to the metathesis reaction, the RBD (refined, bleached, and deodorized) canola oil is pre-treated by mixing the oil with 2% (by weight) bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) and heating to 120 °C with a nitrogen sweep for 1.5 hours. The oil is cooled to room temperature, filtered through a bed of Celite® 545 diatomaceous earth (EMD, Billerica, MA), and stored under inert gas until ready to use.

To a round-bottomed flask, the oil is added and sub-surface sparged with inert gas while mixing and heating to 55 °C. The catalyst is dissolved in 1,2-dichloroethane ([107-06-2], EMD, Billerica, MA) that is stored over 4 Å molecular sieves and sub-surface sparged with inert gas prior

to use. After catalyst addition to the reaction flask, a vacuum is applied to remove volatile olefins that are generated. After ~4 hours reaction time, the vacuum is broken and the metathesized unsaturated polyol ester is cooled to room temperature.

The metathesized canola oil is diluted in hexanes ([110-54-3], EMD, Billerica, MA). To the diluted material, 2% bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) is added and mixed for ~6 hours. The oil is filtered through a bed of Celite® 545 diatomaceous earth. The oil is treated a second time with 2% bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) for ~6 hours. The oil is filtered through a bed of Celite® 545 diatomaceous earth and then rotary evaporated to concentrate.

The metathesized canola oil is then passed through a wipe film evaporator at 180 °C and <0.5 Torr vacuum to remove olefins up to and including C-18 chain lengths. Representative examples are summarized in the table below.

Example	Pretreated Canola Oil (g) ^a	Catalyst	Catalyst (g)	Max Temperature (°C)	Max Vacuum (Torr)
1A	500	1 ^b	0.25	61	7.9
1B	500	2 ^c	0.25	62	0.6

^aCanola oil from J. Edwards, Braintree, MA.

^bTricyclohexylphosphine [4,5-dimethyl-1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] [2-thienylmethylene]ruthenium (II) dichloride [1190427-50-9] available as CatMETium RF-3 from Evonik Corporation, Parsippany, NJ.

^cTricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene][2-thienylmethylene] ruthenium(II) dichloride [1190427-49-6] available as CatMETium RF-2 from Evonik Corporation, Parsippany, NJ.

The samples 1A and 1B are analyzed for weight average molecular weight, iodine value, free hydrocarbon content and oligomer index, using methods described previously, and are found to approximately have the following values:

Example	Mw (g/mol)	Iodine Value (cg/g)	Free Hydrocarbon content (wt%)	Oligomer Index
1A	5,400	85	0.5	0.05

1B	3,900	85	0.5	0.04
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Example 2: Remetathesis of metathesized unsaturated polyol ester

Metathesized canola oil, sufficiently stripped of residual olefins (176.28 g from Example 1A) is blended with pretreated canola oil (350.96 g, pretreated as described in Example 1) in a round-bottomed flask. The blend is sub-surface sparged with inert gas while mixing and heating to 55 °C. The catalyst is dissolved in 1,2-dichloroethane ([107-06-2], EMD, Billerica, MA) that is stored over 4 Å molecular sieves and sub-surface sparged with inert gas prior to use. After catalyst addition to the reaction flask, a vacuum is applied to remove volatile olefins that are generated. After ~4 hours reaction time, the vacuum is broken and the metathesized unsaturated polyol ester is cooled to room temperature.

The metathesized canola oil is diluted in hexanes ([110-54-3], EMD, Billerica, MA). To the diluted material, 2% bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) is added and mixed for ~6 hours. The oil is filtered through a bed of Celite® 545 diatomaceous earth. The oil is treated a second time with 2% bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) for ~6 hours. The oil is filtered through a bed of Celite® 545 diatomaceous earth and then rotary evaporated to concentrate.

The remetathesized canola oil is then passed through a wipe film evaporator at 180 °C and <0.5 Torr vacuum to remove olefins up to and including C-18 chain lengths. A representative example is summarized in the table below.

Example	Oil Blend (g)	Catalyst ^a (g)	Max Temperature (°C)	Max Vacuum (Torr)
2	500	0.27	65	0.2

^aTricyclohexylphosphine [4,5-dimethyl-1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] [2-thienylmethylene]ruthenium (II) dichloride [1190427-50-9] available as CatMETium RF-3 from Evonik Corporation, Parsippany, NJ.

The sample 2 is analyzed for weight average molecular weight, iodine value, free hydrocarbon content and oligomer index, using methods described previously, and is found to approximately have the following values:

Example	Mw (g/mol)	Iodine Value	Free	Oligomer Index
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		(cg/g)	Hydrocarbon content (wt%)	
2	13,000	80	0.5	0.07

Example 3: Synthesis of metathesized unsaturated polyol esters

Prior to the metathesis reaction, the RBD (refined, bleached, and deodorized) oil is pre-treated by mixing the oil with 2% (by weight) bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) and heating to 120 °C with a nitrogen sweep for 1.5 hours. The oil is cooled to room temperature, filtered through a bed of Celite® 545 diatomaceous earth (EMD, Billerica, MA), and stored under inert gas until ready to use.

To a round-bottomed flask, the oil is added and sub-surface sparged with inert gas while mixing and heating to 55 °C. The catalyst is dissolved in 1,2-dichloroethane ([107-06-2], EMD, Billerica, MA) that is stored over 4 Å molecular sieves and sub-surface sparged with inert gas prior to use. After catalyst addition to the reaction flask, a vacuum is applied to remove volatile olefins that are generated. After ~4 hours reaction time, the vacuum is broken and the metathesized unsaturated polyol ester is cooled to room temperature.

The metathesized oil is diluted in hexanes ([110-54-3], EMD, Billerica, MA). To the diluted material, 2% bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) is added and mixed for ~6 hours. The metathesized oil is filtered through a bed of Celite® 545 diatomaceous earth. The metathesized oil is treated a second time with 2% bleaching clay (Filtrol F-160, BASF, Florham Park, NJ) for ~6 hours. The metathesized oil is filtered through a bed of Celite® 545 diatomaceous earth and then rotary evaporated to concentrate.

The metathesized unsaturated polyol ester is then passed through a wipe film evaporator at 180 °C and <0.5 Torr vacuum to remove olefins up to and including C-18 chain lengths.

Representative examples are summarized in the table below.

Example	Starting unsaturated polyol ester	Pretreated Oil (g)	Catalyst ^a (g)	Max Temperature (°C)	Max Vacuum (Torr)
3A	High erucic acid rapeseed	500	0.25	61	7.9

	oil				
3B	Blend of High erucic acid rapeseed oil and canola oil, 50/50 by weight	500 (250g HEAR oil and 250g canola oil)	0.25	61	7.9
3C	High oleic soybean oil	500	0.25	61	7.9

^aTricyclohexylphosphine [4,5-dimethyl-1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] [2-thienylmethylene]ruthenium (II) dichloride [1190427-50-9] available as CatMETium RF-3 from Evonik Corporation, Parsippany, NJ.

5 Example 4

Hydrogenations are performed in a T316 stainless steel, 600 ml Parr reactor (Model Number 4563) containing internal cooling coils and a stir shaft with 2 impellers comprised of 4 blades each.

The metathesized unsaturated polyol ester (approximately 200 g) is dissolved in hexanes (120 ml, [110-54-3], EMD, Billerica Ma). To this solution is added a slurry of Nickel on Silica (20 g, [7440-02-0], Catalog #28-1900, Strem Chemicals, Inc., Newburyport, MA). The slurried mixtures is transferred via vacuum to the Parr reactor. The mixture is degassed with several vacuum/nitrogen fill cycles. Then with stirring (800-900 rpm), hydrogen gas (550-650 psig, [1333-74-0], UHP grade, Wright Brothers, Inc., Montgomery, OH) is charged to the reactor. The reaction is heated at 150 °C and hydrogen gas pressure reduction monitored until constant (~12 hours).

The reaction is cooled to 60 °C and drained from the reactor. The reactor is rinsed with methyl tert-butyl ether ([1634-04-4], EMD, Billerica, MA) and combined with the solid hydrogenated metathesized polyol ester. A hot filtration is then performed to remove the catalyst, followed by vacuum to remove all residual solvent. Fully hydrogenated materials are obtained using the method above. Lower hydrogenation levels are obtained by decreasing the reaction temperature to 125 degrees Celsius using 5 grams of catalyst and reducing the reaction time and hydrogen consumed. Iodine Value (IV) is measured, as described elsewhere.

Example 5

The metathesis monomers, dimers, trimers, tetramers, pentamers, and higher order oligomers from the product in Example 2 are fully separated by SFC using the method described above. The individual SFC fractions are collected and trimers, tetramers, and higher order oligomers are combined. The oligomer index of this sample is about 1.

Example 6

Examples 6 through 18 are exemplary topsheet lotions.

Example 6	INCI	%
Metathesized Unsaturated Polyol Ester of Examples 1-5	Hydrogenated Soy Polyglycerides and C15-23 Alkanes	71%
Beeswax		18%
Isostearyl Isostearate		11%
	TOTAL	100%
Example 7		
Metathesized Unsaturated Polyol Ester of Examples 1-5	Hydrogenated Soy Polyglycerides and C15-23 Alkanes	63%
Cetyl Alcohol		22%
Jojoba Oil		15%
	TOTAL	100%
Example 8		
Metathesized Unsaturated Polyol Ester of Examples 1-5	Hydrogenated Soybean Oil and Hydrogenated Soy Polyglycerides and C15-23 Alkanes	52%
ZnO		7%
Ester Wax		33%
Innotec Wetting Agent		3%
Olive Oil		5%
	TOTAL	100%
Example 9		

Metathesized Unsaturated Polyol Ester of Examples 1-5	Hydrogenated Soybean Oil and Hydrogenated Soy Polyglycerides and C15-23 Alkanes	62%
Ozokerite Wax		29%
Sunflower Oil		9%
	TOTAL	100%
Example 10		
Metathesized Unsaturated Polyol Ester of Examples 1-5	Pentadecane	59%
Kraton G-1650		12%
ZnO		6%
Ester Wax		7%
C12-C15 Alkyl Benzoate	4%	
Innotec Wetting Agent		3%
Petrolatum		9%
	TOTAL	100%
Example 11		
Metathesized Unsaturated Polyol Ester of Examples 1-5	Pentadecane	44%
Candillila Wax		15%
Lanolin		7%
Stearyl Alcohol		25%
Microcrystalline Wax		9%
	TOTAL	100%
Example 12	Supplier (HQ Location)	%
Metathesized Unsaturated Polyol Ester of Examples 1-5		50%
Beeswax (420 ORG from Strahl & Pitsch)	Strahl&Pitsch (West Babylon, NY)	23%
Octyldodecylneopentanoate	Alzo International Inc. (Sayreville, NJ)	6%

(Elefac I-205 from Alzo)		
Di(C12-C15)Alkyl Fumarate (Marrix SF from Alzo)	Alzo International Inc. (Sayreville, NJ)	12%
Zinc Oxide (Zoco 112 USP from Zochem Inc.)	Zochem Inc. (Brampton, ON, Canada)	9%
	TOTAL	100%
Example 13		
Metathesized Unsaturated Polyol Ester of Examples 1-5		51%
Cetostearyl Alcohol (TA-1618 from P&G Chemicals)	Procter & Gamble Inc. (Cincinnati, OH)	11%
Carnauba Wax (#63P from Strahl & Pitsch Inc.)	Strahl&Pitsch (West Babylon, NY)	19%
Joboba Butter (#SP560 from Strahl & Pitsch Inc.)	Strahl&Pitsch (West Babylon, NY)	9%
Neopentyl glycol diethylhexanoate and neopentyl glycol diisostearate (Minno 21 from Alzo)	Alzo International Inc. (Sayreville, NJ)	4%
Zinc Oxide (Zoco 112 USP from Zochem Inc.)	Zochem Inc. (Brampton, ON, Canada)	6%
	TOTAL	100%
Example 14		
Metathesized Unsaturated Polyol Ester of Examples 1-5		42%
Petrolatum (Perfecta from Sonneborn)	Sonneborn (Parsippany, NJ)	11%
Arachidyl Behenate (Waxenol 822 from Alzo)	Alzo International Inc. (Sayreville, NJ)	11%
Candellila Wax Powder (#75P	Strahl&Pitsch (West Babylon, NY)	17%

from Strahl & Pitsch)		
Methylheptyl Isostearate (Beantree from Alzo)	Alzo International Inc. (Sayreville, NJ)	6%
Octyldodecyl Neopentanoate (Elefac I-205 from Alzo)	Alzo International Inc. (Sayreville, NJ)	5%
Zinc Oxide (Zoco 112 USP from Zochem Inc.)	Zochem Inc. (Brampton, ON, Canada)	8%
	TOTAL	100%
Example 15		
Metathesized Unsaturated Polyol Ester of Examples 1-5		28%
Petrolatum (Perfecta from Sonneborn)	Sonneborn (Parsippany, NJ)	19%
Microcrystalline Wax (Multiwax W-835 from Sonneborn)	Sonneborn (Parsippany, NJ)	15%
Ozokerite Wax (#1025 from Strahl & Pitsch)	Strahl&Pitsch (West Babylon, NY)	13%
Mineral Oil (Carnation Mineral Oil from Sonneborn)	Sonneborn (Parsippany, NJ)	9%
Neopentyl glycol diethylhexanoate and neopentyl glycol diisostearate (Minno 21 from Alzo)	Alzo International Inc. (Sayreville, NJ)	5%
Zinc Oxide (Zoco 112 USP from Zochem Inc.)	Zochem Inc. (Brampton, ON, Canada)	11%
	TOTAL	100%
Example 16		
Metathesized Unsaturated Polyol Ester of Examples 1-5		45%
White Petrolatum (SnowWhite	Sonneborn (Parsippany, NJ)	18%

from Sonneborn)		
Di-C12-15 Alkyl Fumarate (Marrix SF from Alzo)	Alzo International Inc. (Sayreville, NJ)	5%
Arachidyl Behenatie (Waxenol 822 from Alzo)	Alzo International Inc. (Sayreville, NJ)	9%
Cetostearyl Fatty Alcohol (TA- 1618 from Procter&Gamble Chemicals)	Procter&Gamble Chemicals (Cincinnati, OH)	11%
Octyldodecyl Neopentanoate (Elefac I-205 from Alzo)	Alzo International Inc. (Sayreville, NJ)	4%
Zinc Oxide (Zoco 112 USP from Zochem Inc.)	Zochem Inc. (Brampton, ON, Canada)	8%
	TOTAL	100%

Example 17		
Metathesized Unsaturated Polyol Ester of Examples 1-5		33%
Di-C12-15 Alkyl Fumarate (Marrix SF from Alzo)	Alzo International Inc. (Sayreville, NJ)	15%
Ozokerite Wax (#1025 from Strahl & Pitsch)	Strahl&Pitsch (West Babylon, NY)	24%
Cetearyl Methicone (SF1632 from Momentive)	Momentive (Waterford, NY)	19%
Caprylyl Isostearate (Beantree from Alzo)	Alzo International Inc. (Sayreville, NJ)	9%
	TOTAL	100%
Example 18		
Metathesized Unsaturated Polyol Ester		30%
Di-C12-15 Alkyl Fumarate (Marrix SF from Alzo)	Alzo International Inc. (Sayreville, NJ)	13%

Ozokerite Wax (#1025 from Strahl & Pitsch)	Strahl&Pitsch (West Babylon, NY)	22%
Petrolatum (G-1958 from Sonneborn Inc.)	Sonneborn (Parsippany, NJ)	14%
Mineral Oil (Lilac from Sonneborn Inc.)	Sonneborn (Parsippany, NJ)	12%
Vegetable Oil (SonneNatural H-203 from Sonneborn Inc.)	Sonneborn (Parsippany, NJ)	9%
	TOTAL	100%

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value.

5 For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm”.

All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document
10 incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover
15 in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. An absorbent article comprising a composition, said composition comprising a metathesized unsaturated polyol ester, said metathesized unsaturated polyol ester having one or more of the following properties:
 - (i) a weight average molecular weight of from 5,000 Daltons to 50,000 Daltons;
 - (ii) an oligomer index from greater than 0 to 1;
 - (iii) an iodine value of from 30 to 200.
2. The absorbent article of claim 1, wherein the composition is applied to at least one component of the article, wherein said absorbent article components are selected from the group consisting of a topsheet, a secondary topsheet, back sheet, barrier cuff, waist band, wing, and waist feature.
3. The absorbent article of claim 1 or 2, wherein the composition further comprises a material selected from the group consisting of emollients, structuring agents, viscosity enhancers, surfactants, skin care ingredients, vitamins, moisturizers, perfumes, aesthetic ingredients, enzyme inhibitors, and combinations thereof.
4. The absorbent article of any of the preceding claims, wherein the metathesized unsaturated polyol ester has a weight average molecular weight of from 5,000 Daltons to 50,000 Daltons.
5. The absorbent article of any of the preceding claims, wherein the metathesized unsaturated polyol ester has an iodine value of from 30 to 200.
6. An absorbent article comprising a composition, said composition comprising a metathesized unsaturated polyol ester, said metathesized unsaturated polyol ester having a weight average molecular weight of from 2,000 Daltons to 50,000 Daltons; and said metathesized unsaturated polyol having one or more of the following properties:
 - (i) a free hydrocarbon content, based on total weight of metathesized unsaturated polyol ester of from 0% to 5%;
 - (ii) an oligomer index from greater than 0 to 1;

- (iii) an iodine value of from 8 to 200.
7. The absorbent article of claim 6, wherein the composition is applied to at least one component of the article, wherein said absorbent article components are selected from the group consisting of a topsheet, a secondary topsheet, back sheet, barrier cuff, waist band, wing, and waist feature.
8. The absorbent article of claim 6 or 7, wherein the composition further comprises a material selected from the group consisting of emollients, structuring agents, viscosity enhancers, surfactants, skin care ingredients, vitamins, moisturizers, perfumes, perfume ingredients, aesthetic ingredients, enzyme inhibitors, hexamidine, hexamidine derivatives, zinc compounds, and combinations thereof.
9. The absorbent article of claim 6, wherein said metathesized unsaturated polyol ester has an iodine value from 10 to 200.
10. The absorbent article of claim 6, wherein said metathesized unsaturated polyol ester has an oligomer index from 0.001 to 1.
11. The absorbent article of claim 6, wherein said metathesized unsaturated polyol ester has a free hydrocarbon content, based on total weight of metathesized unsaturated polyol ester, of from 0% to 5%.
12. The absorbent article of claim 6, wherein the composition comprises, based on total composition weight, from 0.1% to 50% of said metathesized unsaturated polyol ester.
13. The absorbent article of claim 6, wherein the composition comprises one or more of the following:
- a) from 1% to 90%, from 5% to 50%, or from 10% to 25% of an emollient or emollient system;

- b) from 1% to 50%, from 5% to 30%, or from 10% to 20% of a immobilizing (structuring) agent;
 - c) from 1% to 50%, from 1% to 20%, or from 2% to 10% of a viscosity enhancer;
 - d) from 1% to 50%, from 1% to 20%, or from 2% to 10% of a surfactant;
 - 5 e) from 0.1% to 90%, from 0.1% to 20%, or from 1% to 10% of a skin care ingredient;
 - f) from 0.1% to 30%, from 0.1% to 10%, or from 0.1% to 5% of an enzyme inhibitor;
 - g) from 0.1% to 10%, from 0.1% to 5%, or from 0.1% to 1% of a vitamin;
 - h) from 1% to 50%, from 1% to 20%, or from 2% to 10% of a moisturizer or humectant;
 - 10 i) from 0.01 % to 5%, from 0.1% to 2%, or from 0.1% to 1% of a perfume;
 - j) from 0.02% to 10%, from 0.2% to 5%, or from 0.2% to 2% of a perfume delivery system; and
 - k) from 1% to 90%, from 1% to 50%, or from 1% to 25% of a skin aesthetics/skin feel ingredient.
14. The absorbent article of claim 6, wherein the metathesized unsaturated polyol ester is derived from a natural polyol ester and/or a synthetic polyol ester, wherein said natural polyol ester is selected from the group consisting of a vegetable oil, an animal fat, an algae oil, and mixtures thereof; and said synthetic polyol ester is derived from a material selected from the group consisting of ethylene glycol, propylene glycol, glycerol, polyglycerol, polyethylene glycol, polypropylene glycol, poly(tetramethylene ether) glycol, pentaerythritol, dipentaerythritol, tripentaerythritol, trimethylolpropane, neopentyl glycol, a sugar, preferably, sucrose, and mixtures thereof.
15. The absorbent article of claim 6, wherein the metathesized unsaturated polyol ester is selected from the group consisting of metathesized Abyssinian oil, metathesized Almond Oil, metathesized Apricot Oil, metathesized Apricot Kernel oil, metathesized Argan oil, metathesized Avocado Oil, metathesized Babassu Oil, metathesized Baobab Oil, metathesized Black Cumin Oil, metathesized Black Currant Oil, metathesized Borage Oil, metathesized Camelina oil, metathesized Carinata oil, metathesized Canola oil, metathesized Castor oil, metathesized Cherry Kernel Oil, metathesized Coconut oil, metathesized Corn oil, metathesized Cottonseed oil, metathesized Echium Oil, metathesized Evening Primrose Oil,

metathesized Flax Seed Oil, metathesized Grape Seed Oil, metathesized Grapefruit Seed Oil, metathesized Hazelnut Oil, metathesized Hemp Seed Oil, metathesized Jatropha oil, metathesized Jojoba Oil, metathesized Kukui Nut Oil, metathesized Linseed Oil, metathesized Macadamia Nut Oil, metathesized Meadowfoam Seed Oil, metathesized Moringa Oil, metathesized Neem Oil, metathesized Olive Oil, metathesized Palm Oil, metathesized Palm Kernel Oil, metathesized Peach Kernel Oil, metathesized Peanut Oil, metathesized Pecan Oil, metathesized Pennycress oil, metathesized Perilla Seed Oil, metathesized Pistachio Oil, metathesized Pomegranate Seed Oil, metathesized Pongamia oil, metathesized Pumpkin Seed Oil, metathesized Raspberry Oil, metathesized Red Palm Olein, metathesized Rice Bran Oil, metathesized Rosehip Oil, metathesized Safflower Oil, metathesized Seabuckthorn Fruit Oil, metathesized Sesame Seed Oil, metathesized Shea Olein, metathesized Sunflower Oil, metathesized Soybean Oil, metathesized Tonka Bean Oil, metathesized Tung Oil, metathesized Walnut Oil, metathesized Wheat Germ Oil, metathesized High Oleoyl Soybean Oil, metathesized High Oleoyl Sunflower Oil, metathesized High Oleoyl Safflower Oil, metathesized High Erucic Acid Rapeseed Oil, and mixtures thereof.

1/3

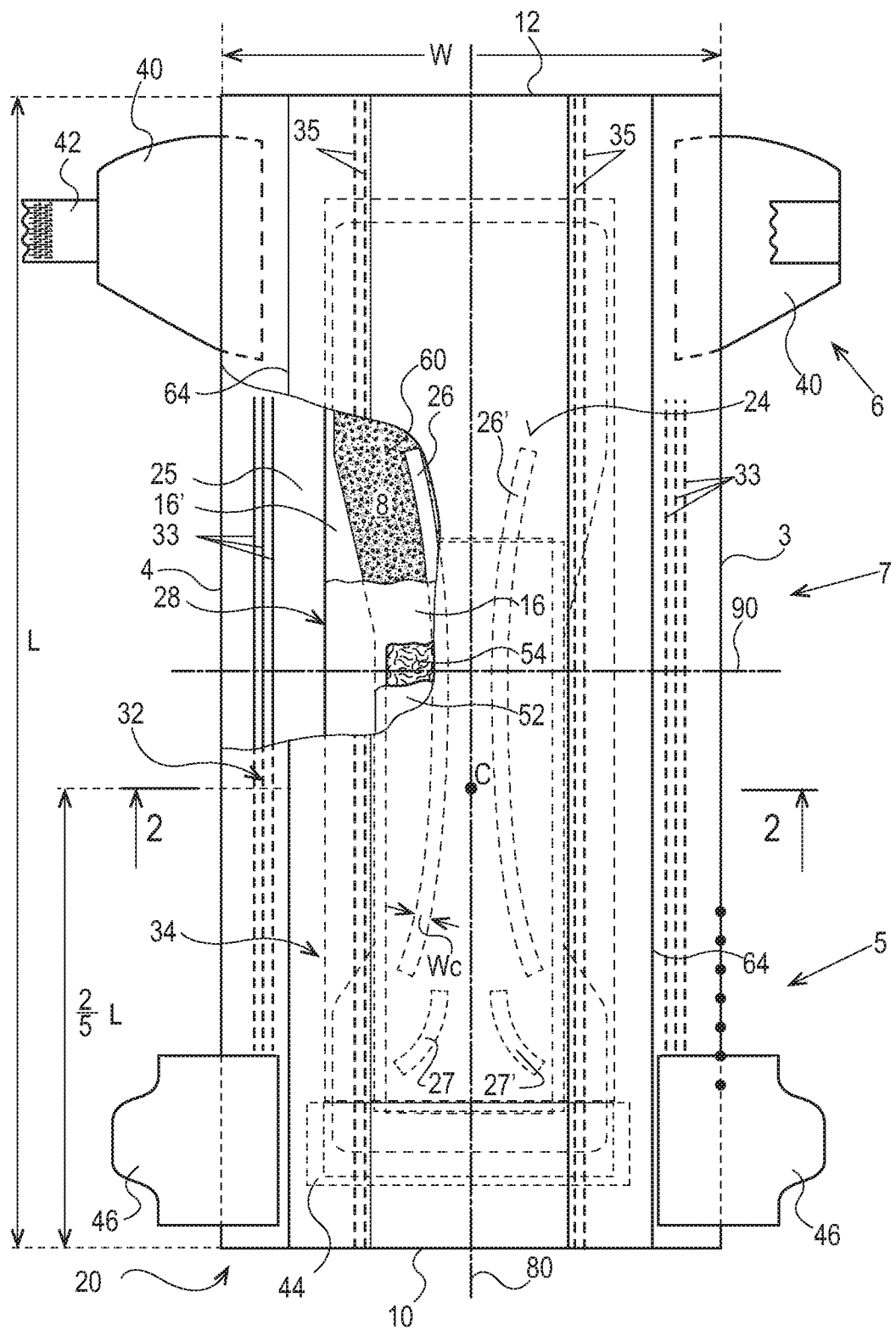
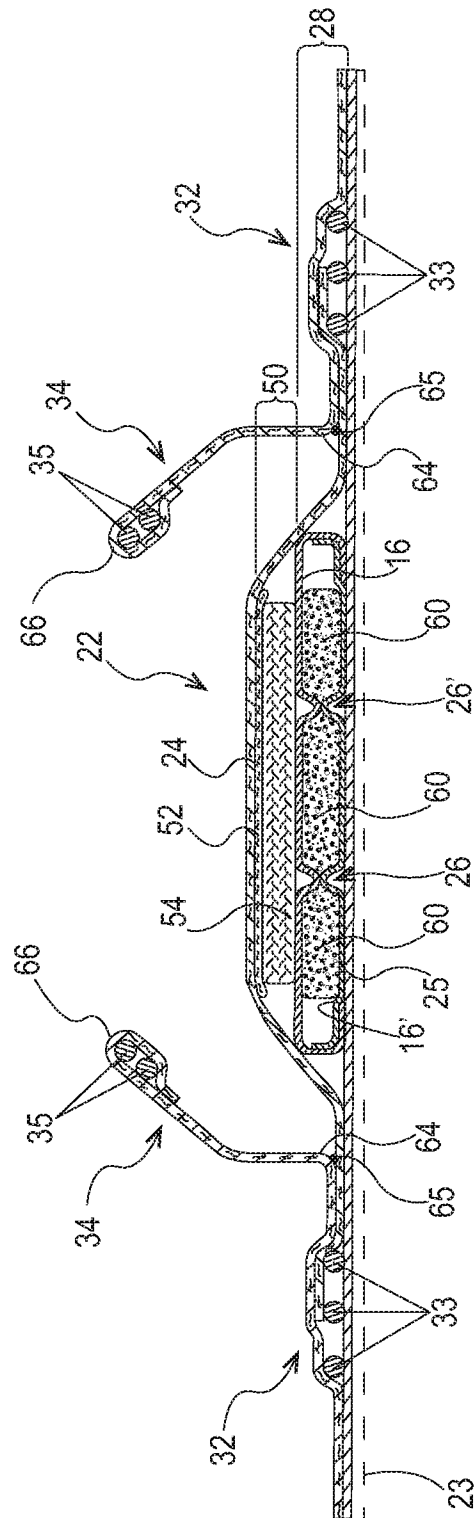


Fig. 1

2. 60
1. 40
1. 10

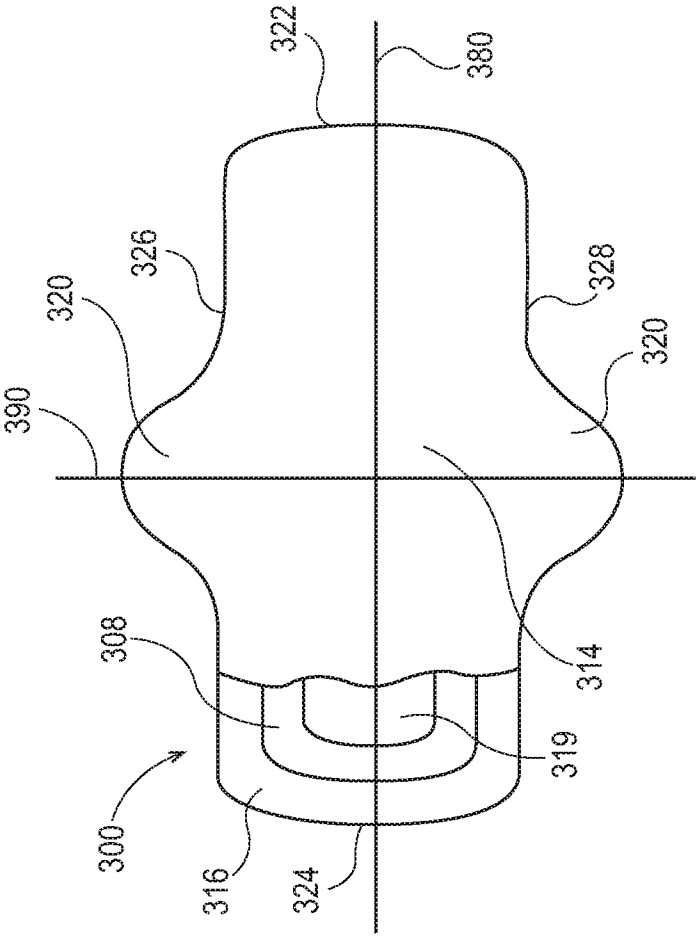


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/047144

A. CLASSIFICATION OF SUBJECT MATTER INV. A61F13/511 A61Q19/10 A61L15/00 C11B3/00 C11C3/00 C10G3/00 ADD. According to International Patent Classification (IPC) or to both national classification and IPC											
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A61F A61Q A61L C11B C11C C10G Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data											
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;"> WO 2008/008420 A1 (CARGILL INC [US]; BRAKSMAYER DIZA PEARL [US]; BOND RISHA [US]; BUNNELL) 17 January 2008 (2008-01-17) page 1, line 21 - line 31 page 2, line 23 - page 9, line 22 page 16, line 6 - line 20 page 17, line 19 - line 31 page 21, line 8 - line 31; figures 1A-1C ----- </td> <td style="text-align: center; vertical-align: top;">1-15</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;"> US 2014/357714 A1 (BRAKSMAYER DIZA PEARL [US] ET AL) 4 December 2014 (2014-12-04) cited in the application paragraph [0002] paragraph [0006] - paragraph [0007] paragraph [0015] paragraph [0090] paragraph [0104] ----- -/-- </td> <td style="text-align: center; vertical-align: top;">1-15</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	WO 2008/008420 A1 (CARGILL INC [US]; BRAKSMAYER DIZA PEARL [US]; BOND RISHA [US]; BUNNELL) 17 January 2008 (2008-01-17) page 1, line 21 - line 31 page 2, line 23 - page 9, line 22 page 16, line 6 - line 20 page 17, line 19 - line 31 page 21, line 8 - line 31; figures 1A-1C -----	1-15	A	US 2014/357714 A1 (BRAKSMAYER DIZA PEARL [US] ET AL) 4 December 2014 (2014-12-04) cited in the application paragraph [0002] paragraph [0006] - paragraph [0007] paragraph [0015] paragraph [0090] paragraph [0104] ----- -/--	1-15
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.									
X	WO 2008/008420 A1 (CARGILL INC [US]; BRAKSMAYER DIZA PEARL [US]; BOND RISHA [US]; BUNNELL) 17 January 2008 (2008-01-17) page 1, line 21 - line 31 page 2, line 23 - page 9, line 22 page 16, line 6 - line 20 page 17, line 19 - line 31 page 21, line 8 - line 31; figures 1A-1C -----	1-15									
A	US 2014/357714 A1 (BRAKSMAYER DIZA PEARL [US] ET AL) 4 December 2014 (2014-12-04) cited in the application paragraph [0002] paragraph [0006] - paragraph [0007] paragraph [0015] paragraph [0090] paragraph [0104] ----- -/--	1-15									
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.											
<table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> * Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; vertical-align: top;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table>			* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family							
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Date of the actual completion of the international search 30 January 2017		Date of mailing of the international search report 06/02/2017									
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Demay, Stéphane									

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/047144

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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