SILK-BASED MOISTURIZER COMPOSITIONS AND METHODS THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is an international application claiming the benefit of U.S. Provisional Application No. 62/154,581, filed on April 29, 2015, the entirety of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates generally to compositions that include silk protein and more particularly, but not exclusively, to moisturizing compositions that include a silk solution that may comprise about 0.05% to about 10 % (w/v) of pure silk fibroin-based protein fragments that are substantially devoid of sericin.

BACKGROUND OF THE INVENTION

[0003] Silk is a natural polymer produced by a variety of insects and spiders. Silk comprises a filament core protein, silk fibroin, and a glue-like coating consisting of a non-filamentous protein, sericin. Silk has been historically studied for use in the medical field. Silk has been well described in its natural fibrous form and is being studied further for potentially useful secondary forms such as silk gels, sponges, serums, films, powders and composites. Many of these secondary forms can only be created after processing the silk fibers into an aqueous silk solution.

[0004] Silk solutions have been generated using a variety of methods with the final solutions having a range of characteristics and varying levels of purity. Silk solutions have not only been used in medical applications, but have also expanded to other areas such as cosmetics and electronics.

BRIEF SUMMARY OF THE INVENTION

[0005] Silk protein fragment compositions and moisturizers manufactured therefrom are disclosed herein. In an embodiment, an article of the present disclosure is a silk moisturizer comprising silk protein fragment compositions. In an embodiment, a silk moisturizer of the present disclosure can be used to address fine lines and wrinkles of the skin, for example fine lines and wrinkles around the mouth and nose. In an embodiment, a silk moisturizer of the present disclosure can be used to address dark spots on the skin. In an embodiment, a silk moisturizer of the present disclosure is used for reducing puffy eyes. In an embodiment, a silk moisturizer of the present disclosure is used for reducing dark circles around the eyes. In an embodiment, a silk gel of the

present disclosure can be used as a firming eye moisturizer. In an embodiment, a silk moisturizer of the present disclosure can replenish moisture and increase cell renewal while restoring radiance. In an embodiment, a silk moisturizer of the present disclosure can be used as a hydrating moisturizer to restore hydration to the skin. In an embodiment, a silk moisturizer of the present disclosure can be used to treat redness, acne and hyperpigmentation of the skin. In an embodiment, an article of the present disclosure is a silk sunscreen moisturizer.

[0006] According to aspects illustrated herein, there is disclosed a moisturizing composition including a silk solution, hyaluronic acid, an oil or butter, and a pH adjusting agent. In some embodiments the silk solution may include about 1% to about 10% (w/v) of pure silk fibroin-based protein fragments that are substantially devoid of sericin. In some embodiments the pure silk fibroin-based protein fragments have an average weight molecular weight ranging from about 6 kDa to about 16 kDa, from about 17 kDa to about 38 kDa, or from about 39 kDa to about 80 kDa. In some embodiments the pure silk fibroin-based protein fragments have a polydispersity of between about 1.5 and about 3.0. In some embodiments the oil or butter is jojoba oil, rosehip oil, glycerin, coconut oil, lemongrass oil, or shea butter. In some embodiments a moisturizing compositions may further include a second oil or butter. In some embodiments the second oil or butter is jojoba oil, rosehip oil, glycerin, coconut oil, lemongrass oil, or shea butter. In some embodiments the first oil or butter is present in an amount of about 0.1% to about 25% (v/v) of the moisturizing composition. In some embodiments the second oil or butter is present in an amount of about 0.1% to about 25% (v/v) of the moisturizing composition. In some embodiments the pH adjusting agent is NaOH. In other embodiments the pH adjusting agent is HCl. In still other embodiments the pH adjusting agent includes a second pH adjusting agent. In some embodiments one of the first pH adjusting agent and the second pH adjusting agent is NaOH and the other of the first pH adjusting agent and the second pH adjusting agent is HCl. In some embodiments a moisturizing composition further includes an additive. Example additives include vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, and combinations thereof. In some embodiments the additive is a combination of vitamin E, aspen bark, and sodium anisate. In some embodiments a moisturizing composition further comprises water.

[0007] According to aspects illustrated herein, there is disclosed a method for preparing a moisturizer composition of pure silk fibroin-based protein fragments including: introducing water into a vessel; adding hyaluronic acid powder is added to the water; mixing the hyaluronic acid and water to form a solution; adding a solution of pure silk fibroin based protein fragments to the hyaluronic acid solution, wherein the pure silk fibroin based protein fragments are substantially devoid of sericin; mixing the hyaluronic acid and pure silk fibroin based protein fragments; introducing one or more oils and/or butters and a pH adjusting agent to the hyaluronic acid/pure silk fibroin protein solution; mixing until a white, lotion-like homogeneous mixture is formed. In some embodiments a method further includes adding an additive to the hyaluronic acid/pure silk fibroin protein solution, and/or adding an additive to the white, white, lotion-like homogenous mixture and mixing. In some embodiments the oil and/or butter is jojoba oil, rosehip oil, glycerin, coconut oil, lemongrass oil, shea butter, or a combination thereof. In some embodiments the pure silk fibroin-based protein fragments have an average weight molecular weight ranging from about 6 kDa to about 16 kDa, from about 17 kDa to about 38 kDa, or from about 39 kDa to about 80 kDa. In some embodiments the pure silk fibroin-based protein fragments have a polydispersity of between about 1.5 and about 3.0.

[0008] In some embodiments the silk solution (or pure silk fibroin based protein fragments) is substantially homogenous, wherein the silk solution includes between 0 ppm and about 500 ppm of inorganic residuals, and wherein the silk solution includes between 0 ppm and about 500 ppm of organic residuals. In an embodiment, the silk solution has between about 10 ppm and about 300 ppm of lithium bromide residuals and between about 10 ppm and about 100 ppm of sodium carbonate residuals. In an embodiment, the lithium bromide residuals are measurable using a high-performance liquid chromatography lithium bromide assay, and the sodium carbonate residuals are measurable using a high-performance liquid chromatography sodium carbonate assay. In an embodiment, the pure silk fibroin-based protein fragments are in the form of a solution. In an embodiment, the silk solution composition includes from about 0.1 wt% to about 30 wt% pure silk fibroin-based protein fragments. In other embodiments, the silk solution composition includes from about 0.1 wt% to about 20 wt%, 1% to about 15%, about 2% to about 10%, about 5%, about 6%, or about 7% pure silk fibroin-based protein fragments. The pure silk fibroin-based protein fragments may be stable in the solution for at least 30 days. In an embodiment, the term "stable" refers to the absence of

spontaneous or gradual gelation, with no visible change in the color or turbidity of the solution. In an embodiment, the term "stable" refers to no aggregation of fragments and therefore no increase in molecular weight over time. In an embodiment, the silk solution composition is in the form of an aqueous solution. In an embodiment, the silk solution composition is in the form of an organic solution. The silk solution composition may be provided in a sealed container. In some embodiments, the composition further includes one or more molecules selected from the group consisting of therapeutic agents, growth factors, antioxidants, proteins, vitamins, carbohydrates, polymers, nucleic acids, salts, acids, bases, biomolecules, glycosamino glycans, polysaccharides, extracellular matrix molecules, metals, metal ion, metal oxide, synthetic molecules, polyanhydrides, ceils, fatty acids, fatty alcohols, emollients, humectants, acid salts, emulsifiers, chelating agents fragrance, minerals, plants, plant extracts, preservatives, proteoglycans, essential oils, peptides, alcohols, tinting agents, titanium dioxide, zinc oxide, oat flour, and chemical UV filters. In an embodiment, the added molecule or molecules are stable (i.e., retain activity over time) within the composition and can be released at a desired rate. In an embodiment, the one or more molecules is vitamin C, Vitamin B, Vitamin A, or a derivative thereof. In an embodiment, the composition further includes an alpha hydroxy acid selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. In an embodiment, the composition further includes hyaluronic acid or its salt form at a concentration of about 0.5% to about 10.0%. In an embodiment, the composition further includes at least one of zinc oxide or titanium dioxide. In an embodiment, the pure silk fibroin-based protein fragments in the composition are hypoallergenic. In an embodiment, the pure silk fibroin-based protein fragments are biocompatible, non-sensitizing, and non-immunogenic. In an embodiment, the pure silk fibroin-based protein fragments are bioresorbable or biodegradable following implantation or application. In an embodiment, the pure silk fibroin-based protein fragments are hypoallergenic.

[0009] According to aspects illustrated herein, there is disclosed a silk solution composition that includes pure silk fibroin-based protein fragments that are substantially devoid of sericin, wherein the silk solution composition has an average weight average molecular weight ranging from about 39 kDa to about 80 kDa, wherein the silk solution composition has a polydispersity of between about 1.5 and about 3.0, wherein the silk solution composition is substantially homogenous, wherein the silk solution composition includes between 0 ppm and about 500 ppm of inorganic residuals, and

wherein the silk solution composition includes between 0 ppm and about 500 ppm of organic residuals, in an embodiment, the pure silk fibroin-based protein fragments have between about 10 ppm and about 300 ppm of lithium bromide residuals and between about 10 ppm and about 100 ppm of sodium carbonate residuals. In an embodiment, the lithium bromide residuals are measurable using a high-performance liquid chromatography lithium bromide assay, and the sodium carbonate residuals are measurable using a high-performance liquid chromatography sodium carbonate assay. In an embodiment, the silk solution composition is in the form of a solution. In an embodiment, the silk solution composition includes from about 0.1 wt% to about 30.0 wt% pure silk fibroin-based protein fragments. In other embodiments, the silk solution composition includes from about 0.1 wt% to about 20 wt%, 1% to about 15%, about 2% to about 10%, about 5%, about 6%, or about 7% pure silk fibroin-based protein fragments. The pure silk fibroin-based protein fragments are stable in the solution for at least 30 days. In an embodiment, the term "stable" refers to the absence of spontaneous or gradual gelation, with no visible change in the color or turbidity of the solution. In an embodiment, the term "stable" refers to no aggregation of fragments and therefore no increase in molecular weight over time. In an embodiment, the composition is in the form of an aqueous solution. In an embodiment, the composition is in the form of an organic solution. The composition may be provided in a sealed container. In some embodiments, the composition further includes one or more molecules selected from the group consisting of therapeutic agents, growth factors, antioxidants, proteins, vitamins, carbohydrates, polymers, nucleic acids, salts, acids, bases, biomolecules, glycosamino glycans, polysaccharides, extracellular matrix molecules, metals, metal ion, metal oxide, synthetic molecules, polyanhydrides, cells, fatty acids, fragrance, minerals, plants, plant extracts, preservatives and essential oils. In an embodiment, the added molecule or molecules are stable (i.e., retain activity over time) within the composition and can be released at a desired rate. In an embodiment, the one or more molecules is vitamin C, Vitamin B, Vitamin A, or a derivative thereof. In an embodiment, the composition further includes an alpha hydroxy acid selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. In an embodiment, the composition further includes hyaluronic acid or its salt form at a concentration of about 0.5% to about 10.0%. In an embodiment, the composition further includes at least one of zinc oxide or titanium dioxide. In an embodiment, the pure silk fibroin-based protein fragments in the composition are hypoallergenic. In an embodiment, the pure silk fibroin-based protein fragments are

biocompatible, non-sensitizing, and non-immunogenic. In an embodiment, the pure silk fibroin-based protein fragments are bioresorbable or biodegradable following implantation or application.

[0010] According to aspects illustrated herein, there is disclosed a moisturizing composition that includes pure silk fibroin-based protein fragments substantially devoid of sericin and comprising: an average weight average molecular weight ranging from about 17 kDa to about 38 kDa; and a polydispersity of between about 1.5 and about 3.0, wherein the moisturizing composition has a water content ranging from about 2.0 wt. % to about 20.0 wt. %, wherein the moisturizing composition includes between about 0 ppm and about 500 ppm of inorganic residuals, wherein the moisturizing composition includes between about 0 ppm and about 500 ppm of organic residuals. In an embodiment, the moisturizing composition includes between about 1.0% and about 50.0% crystalline protein domains and being soluble when submersed in water at room temperature. In an embodiment, the moisturizing composition includes from about 1 wt. % to about 30 wt. % of pure silk fibroin-based protein fragments. In other embodiments, the silk solution composition includes from about 0.1 wt% to about 20 wt%, 1% to about 15%, about 2% to about 10%, about 5%, about 6%, or about 7% pure silk fibroin-based protein fragments.

[0011] In an embodiment, the moisturizing composition has a pH from about 1.0 to about 8.0. In an embodiment, the moisturizing composition further includes one or more molecules selected from the group consisting of therapeutic agents, growth factors, antioxidants, proteins, carbohydrates, polymers, nucleic acids, salts, acids, bases, biomolecules, glycosamino glycans, polysaccharides, extracellular matrix molecules, metals, metal ion, metal oxide, synthetic molecules, polyanhydrides, cells, fatty acids, fragrance, minerals, plants, plant extracts, preservatives and essential oils. In an embodiment, the moisturizing composition further includes an alpha hydroxy acid selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. In an embodiment, the moisturizing composition further includes hyaluronic acid or its salt form at a concentration ranging from about 0.5 wt. % to about 10.0 wt. %. In an embodiment, the moisturizing composition further includes at least one of zinc oxide or titanium dioxide. In an embodiment, the moisturizing composition further includes an additive selected from vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, honeysuckle blend, or combinations thereof. In an embodiment, the moisturizing composition is packaged in an airtight container. In an embodiment, the moisturizing

composition is sufficiently designed for topical application. In an embodiment, the topical application is for cosmetic use. In an embodiment, the topical application is for wound dressing.

[0012] In an embodiment, a method of reducing fine lines and wrinkles includes applying a moisturizing composition of the present disclosure daily to human skin for a period of at least one week and observing a reduction in fine lines and wrinkles on the human skin. In an embodiment, a method of smoothing and rejuvenating human skin includes applying a moisturizing composition of the present disclosure daily to human skin for a period of at least one week and observing an improvement in skin texture. In an embodiment, a method of moisturizing human skin includes applying daily a moisturizing composition of the present disclosure to human skin for a period of at least one week and observing an improvement in skin hydration. In an embodiment, a method of moisturizing human skin includes applying twice daily a moisturizing composition of the present disclosure to human skin for a period of at least one week and observing an improvement in skin hydration.

[0013] According to aspects illustrated herein, there is disclosed a method for preparing an aqueous solution of pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from about 6 kDa to about 16 kDa, the method including the steps of: degumming a silk source by adding the silk source to a boiling (100°C) aqueous solution of sodium carbonate for a treatment time of between about 30 minutes to about 60 minutes; removing sericin from the solution to produce a silk fibroin extract comprising non-detectable levels of sericin; draining the solution from the silk fibroin extract; dissolving the silk fibroin extract in a solution of lithium bromide having a starting temperature upon placement of the silk fibroin extract in the lithium bromide solution that ranges from about 60°C to about 140°C; maintaining the solution of silk fibroin-lithium bromide in an oven having a temperature of about 140°C for a period of at least 1 hour; removing the lithium bromide from the silk fibroin extract; and producing an aqueous solution of silk protein fragments, the aqueous solution comprising: fragments having an average weight average molecular weight ranging from about 6 kDa to about 16 kDa, and wherein the aqueous solution of pure silk fibroin-based protein fragments comprises a polydispersity of between about 1.5 and about 3.0. In an embodiment, the method includes the step of drying the silk fibroin extract prior to the dissolving step. In an embodiment, the amount of lithium bromide residuals in

the aqueous solution can be measured using a high-performance liquid chromatography lithium bromide assay. In an embodiment, the amount of sodium carbonate residuals in the aqueous solution can be measured using a high-performance liquid chromatography sodium carbonate assay. In an embodiment, the method includes the step of adding a therapeutic agent to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method includes the step of adding a molecule selected from one of an antioxidant or an enzyme to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method includes the step of adding a vitamin to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the vitamin is selected from one of vitamin C, vitamin B, vitamin A, or a derivative thereof. In an embodiment, the method further includes the step of adding an alpha hydroxy acid to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the alpha hydroxy acid is selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. In an embodiment, the method further includes the step of adding hyaluronic acid at a concentration of about 0.5% to about 10.0% to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method further includes the step of adding at least one of zinc oxide or titanium dioxide to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method further includes the step of lyophilizing the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, a cosmetic film is fabricated from the aqueous solution of silk protein fragments. In an embodiment, a cosmetic gel is fabricated from the aqueous solution of silk protein fragments.

[0014] According to aspects illustrated herein, there is disclosed a method for preparing an aqueous solution of pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from about 17 kDa to about 38 kDa, the method including the steps of: adding a silk source to a boiling (100°C) aqueous solution of sodium carbonate for a treatment time of between about 30 minutes to about 60 minutes so as to result in degumming; removing sericin from the solution to produce a silk fibroin extract comprising non-detectable levels of sericin; draining the solution from the silk fibroin extract; dissolving the silk fibroin extract in a solution of lithium bromide having a starting temperature upon placement of the silk fibroin extract in the lithium bromide solution that ranges from about 80°C to about 140°C; maintaining the solution of silk fibroin-lithium bromide in a dry oven having a temperature in the range between about 60°C to about 100°C for a period of at least 1 hour; removing the lithium bromide from the silk fibroin

extract; and producing an aqueous solution of pure silk fibroin-based protein fragments, wherein the aqueous solution of pure silk fibroin-based protein fragments comprises lithium bromide residuals of between about 10 ppm and about 300 ppm, wherein the aqueous solution of silk protein fragments comprises sodium carbonate residuals of between about 10 ppm and about 100 ppm, wherein the aqueous solution of pure silk fibroin-based protein fragments comprises fragments having an average weight average molecular weight ranging from about 17 kDa to about 38 kDa, and wherein the aqueous solution of pure silk fibroin-based protein fragments comprises a polydispersity of between about 1.5 and about 3.0. In an embodiment, the method includes the step of drying the silk fibroin extract prior to the dissolving step. In an embodiment, the amount of lithium bromide residuals in the aqueous solution can be measured using a high-performance liquid chromatography lithium bromide assay. In an embodiment, the amount of sodium carbonate residuals in the aqueous solution can be measured using a high-performance liquid chromatography sodium carbonate assay. In an embodiment, the method includes the step of adding a therapeutic agent to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method includes the step of adding a molecule selected from one of an antioxidant or an enzyme to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method includes the step of adding a vitamin to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the vitamin is selected from one of vitamin C, vitamin B, vitamin A, or a derivative thereof. In an embodiment, the method further includes the step of adding an alpha hydroxy acid to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the alpha hydroxy acid is selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. In an embodiment, the method further includes the step of adding hyaluronic acid at a concentration of about 0.5% to about 10.0% to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method further includes the step of adding at least one of zinc oxide or titanium dioxide to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method further includes the step of lyophilizing the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, a moisturizing composition is fabricated from the aqueous solution of silk protein fragments.

[0015] According to aspects illustrated herein, there is disclosed a method for preparing an aqueous solution of pure silk fibroin-based protein fragments having an average weight average

molecular weight ranging from about 39 kDa to about 80 kDa, the method including the steps of: adding a silk source to a boiling (100°C) aqueous solution of sodium carbonate for a treatment time of about 30 minutes so as to result in degumming; removing sericin from the solution to produce a silk fibroin extract comprising non-detectable levels of sericin; draining the solution from the silk fibroin extract; dissolving the silk fibroin extract in a solution of lithium bromide having a starting temperature upon placement of the silk fibroin extract in the lithium bromide solution that ranges from about 80°C to about 140°C; maintaining the solution of silk fibroin-lithium bromide in a dry oven having a temperature in the range between about 60°C to about 100°C for a period of at least 1 hour; removing the lithium bromide from the silk fibroin extract; and producing an aqueous solution of pure silk fibroin-based protein fragments, wherein the aqueous solution of pure silk fibroin-based protein fragments comprises lithium bromide residuals of between about 10 ppm and about 300 ppm, sodium carbonate residuals of between about 10 ppm and about 100 ppm, fragments having an average weight average molecular weight ranging from about 40 kDa to about 65 kDa, and wherein the aqueous solution of pure silk fibroin-based protein fragments comprises a polydispersity of between about 1.5 and about 3.0. In an embodiment, the method includes the step of drying the silk fibroin extract prior to the dissolving step, in an embodiment, the amount of lithium bromide residuals in the aqueous solution can be measured using a high-performance liquid chromatography lithium bromide assay. In an embodiment, the amount of sodium carbonate residuals in the aqueous solution can be measured using a high-performance liquid chromatography sodium carbonate assay. In an embodiment, the method includes the step of adding a therapeutic agent to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method includes the step of adding a molecule selected from one of an antioxidant or an enzyme to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method includes the step of adding a vitamin to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the vitamin is selected from one of vitamin C, vitamin B, vitamin A, or a derivative thereof, in an embodiment, the method further includes the step of adding an alpha hydroxy acid to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the alpha hydroxy acid is selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. In an embodiment, the method further includes the step of adding hyaluronic acid at a concentration of about 0.5% to about 10.0% to the aqueous solution of pure silk fibroin-based

protein fragments. In an embodiment, the method further includes the step of adding at least one of zinc oxide or titanium dioxide to the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, the method further includes the step of lyophilizing the aqueous solution of pure silk fibroin-based protein fragments. In an embodiment, a moisturizing composition is fabricated from the aqueous solution of silk protein fragments.

[0016] According to aspects illustrated herein, moisturizing compositions manufactured from SPF mixture solutions of the present disclosure are disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The presently disclosed embodiments will be further explained with reference to the attached drawings and appendix. The drawings shown are not necessarily to scale, with emphasis instead generally being placed upon illustrating the principles of the presently disclosed embodiments.

[0018] Fig. 1 is a flow chart showing various embodiments for producing pure silk fibroin-based protein fragments (SPFs) of the present disclosure.

[0019] Fig. 2 is a flow chart, showing various parameters that can be modified during the process of producing SPFs of the present disclosure during the extraction and the dissolution steps.

[0020] Fig. 3 is a photograph showing dry extracted silk fibroin.

[0021] Fig. 4 is a photograph showing an embodiment of a SPF in the form of a solution of the present disclosure.

[0022] Figs. 5A-5D are photographs showing dissolved silk in room temperature lithium bromide (LiBr) solutions dissolved in a 60°C oven for 4 hours (sericin extraction temperature and time were varied).

[0023] Figs. 6A-6D are photographs showing dissolved silk in room temperature LiBr solutions dissolved in a 60°C oven for 6 hours (sericin extraction temperature and time were varied).

[0024] Figs. 7A-7D are photographs showing dissolved silk in room temperature LiBr solutions dissolved in a 60°C oven for 8 hours (sericin extraction temperature and time were varied).

[0025] Figs. 8A-8D are photographs showing dissolved silk in room temperature LiBr solutions dissolved in a 60°C oven for 12 hours (sericin extraction temperature and time were varied).

[0026] Figs. 9A-9D are photographs showing dissolved silk in room temperature LiBr solutions dissolved in a 60°C oven for 24 hours (sericin extraction temperature and time were varied).

[0027] Figs. 10A-10D are photographs showing dissolved silk in room temperature LiBr solutions dissolved in a 60°C oven for 168/192 hours (sericin extraction temperature and time were varied).

[0028] Figs. 11A-11C are photographs showing dissolved silk in room temperature LiBr solutions dissolved in 60°C oven for 1, 4, and 6 hours, where sericin extraction was completed at 100°C for 60 min.

[0029] Figs. 12A-12D are photographs showing dissolved silk in 60°C LiBr solutions dissolved in a 60°C oven for 1 hour (sericin extraction temperature and time were varied).

[0030] Figs. 13A-13D are photographs showing dissolved silk in 60°C LiBr solutions dissolved in a 60°C oven for 4 hours (sericin extraction temperature and time were varied).

[0031] Figs. 14A-14D are photographs showing dissolved silk in 60°C LiBr solutions dissolved in a 60°C oven for 6 hours (sericin extraction temperature and time were varied).

[0032] Figs. 15A-15D are photographs showing dissolved silk in 80°C LiBr solutions dissolved in a 60°C oven for 1 hour (sericin extraction temperature and time were varied).

[0033] Figs. 16A-16D are photographs showing dissolved silk in 80°C LiBr solutions dissolved in a 60°C oven for 4 hours (sericin extraction temperature and time were varied).

[0034] Figs. 17A-17D are photographs showing dissolved silk in 80°C LiBr solutions dissolved in a 60°C oven for 6 hours (sericin extraction temperature and time were varied).

[0035] Figs. 18A-18D are photographs showing dissolved silk in 100°C LiBr solutions dissolved in a 60°C oven for 1 hour (sericin extraction temperature and time were varied).

[0036] Figs. 19A-19D are photographs showing dissolved silk in 100°C LiBr solutions dissolved in a 60°C oven for 4 hours (sericin extraction temperature and time were varied).

[0037] Figs. 20A-20D are photographs showing dissolved silk in 100°C LiBr solutions dissolved in a 60°C oven for 6 hours (sericin extraction temperature and time were varied).

[0038] Figs. 21A-21D are photographs showing dissolved silk in 140°C (boiling point for LiBr) LiBr solutions dissolved in a 60°C oven for 1 hour (sericin extraction temperature and time were varied time).

[0039] Figs. 22A-22D are photographs showing dissolved silk in 140°C (boiling point for LiBr) LiBr solutions dissolved in a 60°C oven for 4 hours (sericin extraction temperature and time were varied).

[0040] Figs. 23A-23D are photographs showing dissolved silk in 140°C (boiling point for LiBr) LiBr solutions dissolved in a 60°C oven for 6 hours (sericin extraction temperature and time were varied).

[0041] Figs. 24A-24D are photographs showing dissolved silk in 80°C LiBr solutions dissolved in a 80°C oven for 1 hour (sericin extraction temperature and time were varied).

[0042] Figs. 25A-25D are photographs showing dissolved silk in 80°C LiBr solutions dissolved in a 80°C oven for 4 hours (sericin extraction temperature and time were varied).

[0043] Figs. 26A-26D are photographs showing dissolved silk in 80°C LiBr solutions dissolved in a 80°C oven for 6 hours (sericin extraction temperature and time were varied).

[0044] Figs. 27A-27D are photographs showing dissolved silk in 100°C LiBr solutions dissolved in a 100°C oven for 1 hour (sericin extraction temperature and time were varied).

[0045] Figs. 28A-28D are photographs showing dissolved silk in 100°C LiBr solutions dissolved in a 100°C oven for 4 hours (sericin extraction temperature and time were varied).

[0046] Figs. 29A-29D are photographs showing dissolved silk in 100°C LiBr solutions dissolved in a 100°C oven for 6 hours (sericin extraction temperature and time were varied).

[0047] Figs. 30A-30D are photographs showing dissolved silk in 140°C (boiling point for LiBr) LiBr solutions dissolved in a 120°C oven for 1 hour (sericin extraction temperature and time were varied).

[0048] Figs. 31A-31D are photographs showing dissolved silk in 140°C (boiling point for LiBr) LiBr solutions dissolved in a 120°C oven for 4 hours (sericin extraction temperature and time were varied).

[0049] Fig. 32A-32D are photographs showing dissolved silk in 140°C (boiling point for LiBr) LiBr solutions dissolved in a 120°C oven for 6 hours (sericin extraction temperature and time were varied).

[0050] Fig, 33 is a flow chart showing an embodiment for producing a silk film of the present disclosure from a silk solution of the present disclosure.

[0051] Fig. 34 summarizes an embodiment of parameters for a silk film drying study of the present disclosure.

[0052] Fig. 35 is a graph showing silk film drying times (under various air flow and temperature conditions).

[0053] Figs. 36A and 36B show HPLC chromatograms from samples comprising vitamin C. Fig. 36A shows peaks from (1) a chemically stabilized sample of vitamin C at ambient conditions and (2) a sample of vitamin C taken after 1 hour at ambient conditions without chemical stabilization to prevent oxidation, where degradation products are visible. Fig. 36B shows peaks from two different embodiments of silk films of the present disclosure that were aged for at least 30 days at room temperature. No degradation products were visible.

[0054] Figs. 37A-37D are photographs showing silk protein fragment-films of the present disclosure dried at room temperature for 48 hours with open air flow.

[0055] Figs. 38A-38D are photographs showing silk protein fragment-films of the present disclosure dried at 40°C in a convection oven for 8 hours with open air flow.

[0056] Figs. 39A-39D are photographs showing silk protein fragment-films of the present disclosure dried at 40°C in a convection oven for 48 hours with open air flow.

[0057] Figs. 40A-40D are photographs showing silk protein fragment-films of the present disclosure dried at 40°C in a convection oven for 48 hours in closed dish.

[0058] Figs. 41A-41D are photographs showing silk protein fragment-films of the present disclosure dried at 54°C in a convection oven for 8 hours in open dish.

[0059] Figs. 42A-42D are photographs showing silk protein fragment-films of the present disclosure dried at 54°C in a convection oven for 48 hours in open dish.

[0060] Figs, 43A-43D are photographs showing silk protein fragment-films of the present disclosure dried at 54°C in a film dryer for 8 hours in open dish.

[0061] Figs. 44A-44D are photographs showing silk protein fragment-films of the present disclosure dried at 54°C in a film dryer for 48 hours in open dish.

[0062] Figs. 45A-45D are photographs showing silk protein fragment-films of the present disclosure dried at room temperature in a convection oven for 48 hours in open dish.

[0063] Figs. 46A-46D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at room temperature for 48 hours with open air flow.

[0064] Figs. 47A-47D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at 40°C in a convection oven for 8 hours with open air flow.

[0065] Figs. 48A-48D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at 40°C in a convection oven for 48 hours with open air flow.

[0066] Figs. 49A-49D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at 40°C in a convection oven for 48 hours in closed dish.

[0067] Figs. 50A-50D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at 54°C in a convection oven for 8 hours in open dish.

[0068] Figs. 51A-51D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at 54°C in a convection oven for 48 hours in open dish.

[0069] Figs, 52A-52D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at 54°C in a film dryer for 8 hours in open dish.

[0070] Figs. 53A-53D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at 54°C in a film dryer for 48 hours in open dish.

[0071] Figs. 54A-54D are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure dried at room temperature in a convection oven for 48 hours in open dish.

[0072] Fig. 55 is a table summarizing the LiBr and Sodium Carbonate Na_2CO_3) concentration in silk protein solutions of the present disclosure.

[0073] Fig. 56 is a table summarizing the Na_2CO_3 concentration in silk protein fragment-films of the present disclosure.

[0074] Fig. 57 is a table summarizing the LiBr concentration in silk protein fragment-films of the present disclosure.

[0075] Fig. 58 is a table summarizing the LiBr and Na_2CO_3 concentration in silk protein solutions of the present disclosure.

[0076] Fig. 59 is a table summarizing the vitamin C concentration in silk protein fragment-films of the present disclosure.

[0077] Fig. 60 is a table summarizing the stability of vitamin C in chemically stabilized solutions.

[0078] Fig. 61 is a table summarizing the Molecular Weights of silk protein solutions of the present disclosure.

[0079] Figs. 62A and 62B are graphs representing the effect of extraction volume on % mass loss.

[0080] Fig. 63 is a table summarizing the Molecular Weights of silk dissolved from different concentrations of LiBr and from different extraction and dissolution sizes.

[0081] Fig. 64 is a graph summarizing the effect of Extraction Time on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 100°C LiBr and 100°C Oven Dissolution (Oven/Dissolution Time was varied).

[0082] Fig. 65 is a graph summarizing the effect of Extraction Time on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, boiling LiBr and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

[0083] Fig. 66 is a graph summarizing the effect of Extraction Time on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 60°C LiBr and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

[0084] Fig. 67 is a graph summarizing the effect of Extraction Time on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 80°C LiBr and 80°C Oven Dissolution (Oven/Dissolution Time was varied).

[0085] Fig. 68 is a graph summarizing the effect of Extraction Time on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 80°C LiBr and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

[0086] Fig. 69 is a graph summarizing the effect of Extraction Time on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 100°C LiBr and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

[0087] Fig. 70 is a graph summarizing the effect of Extraction Time on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 140°C LiBr and 140°C Oven Dissolution (Oven/Dissolution Time was varied).

[0088] Fig. 71 is a graph summarizing the effect of Extraction Temperature on Molecular Weight of silk processed under the conditions of 60 minute Extraction Time, 100°C LiBr and 100°C Oven Dissolution (Oven Dissolution Time was varied).

[0089] Fig. 72 is a graph summarizing the effect of LiBr Temperature on Molecular Weight of silk processed under the conditions of 60 minute Extraction Time, 100°C Extraction Temperature and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

[0090] Fig. 73 is a graph summarizing the effect of LiBr Temperature on Molecular Weight of silk processed under the conditions of 30 minute Extraction Time, 100°C Extraction Temperature and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

[0091] Fig. 74 is a graph summarizing the effect of Oven/Dissolution Temperature on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 30 minute Extraction Time, and 100°C Lithium Bromide (Oven/Dissolution Time was varied).

[0092] Fig. 75 is a graph summarizing the effect of Oven/Dissolution Temperature on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 60 minute Extraction Time, and 100°C Lithium Bromide. (Oven/Dissolution Time was varied).

[0093] Fig. 76 is a graph summarizing the effect of Oven/Dissolution Temperature on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 60 minute Extraction Time, and 140°C Lithium Bromide (Oven/Dissolution Time was varied).

[0094] Fig. 77 is a graph summarizing the effect of Oven/Dissolution Temperature on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 30 minute Extraction Time, and 140°C Lithium Bromide (Oven/Dissolution Time was varied).

[0095] Fig. 78 is a graph summarizing the effect of Oven/Dissolution Temperature on Molecular Weight of silk processed under the conditions of 100°C Extraction Temperature, 60 minute Extraction Time, and 80°C Lithium Bromide (Oven/Dissolution Time was varied).

[0096] Fig. 79 is a graph summarizing the Molecular Weights of silk processed under varying conditions including Extraction Time, Extraction Temperature, Lithium Bromide (LiBr) Temperature, Oven Temperature for Dissolution, Oven Time for Dissolution.

[0097] Fig. 80 is a graph summarizing the Molecular Weights of silk processed under conditions in which Oven/Dissolution Temperature is equal to LiBr Temperature.

[0098] Fig. 81 is a graph representing the % Activity of Vitamin C in PureProC™ Gel.

[0099] Figs. 82A-82C are photographs showing the effect of film drying on film color and physical integrity after storage (most dry (Fig. 82A), least dry (Fig. 82C)).

[00100] Figs. 83A and 83B are photographs of a laser cut silk film,

[00101] Fig. 84 is a graph summarizing the quantity of vitamin C in a daily dose (i.e., the average amount of product used to cover a 25 cm^2 area of skin) of PureProC™ and competitor products over a 30 day period.

[00102] Fig. 85 is a graph summarizing the ease of use of PureProC™ collected in a user experience.

[00103] Fig. 86 is a summary of the initial benefits of PureProC™ observed by users and support of consumer knowledge.

[00104] Fig. 87 is a graph summarizing where trial participants used PureProC™ Smoothing Gel.

[00105] Fig. 88 is a summary of the benefits to the skin after using PureProC™ Smoothing Gel: Lemongrass by trial participants.

[00106] Figs. 89A-89B are tables summarizing the effect of vitamin C with or without a vitamin C derivative on gelation.

[00107] Fig. 90 is a table summarizing the effect of vitamin C and vitamin C derivatives on the formation of silk films of the present disclosure.

[00108] Figs. 91A-91B are tables summarizing the effect of vitamin C and caffeine on the formation of silk films of the present disclosure.

[00109] Fig. 92 is a table summarizing an embodiment of a caffeine gel of the present disclosure.

[00110] Fig. 93 is a table summarizing embodiments of preservative gels of the present disclosure.

[00111] Figs. 94A-94C are tables summarizing embodiments of cosmetic serums of the present disclosure with varying additives and concentrations of components suitable for protection against ultraviolet radiation (UV).

[00112] Figs. 95A-95C are tables summarizing embodiments of high concentration vitamin C gels of the present disclosure.

[00113] Fig. 96 is a table summarizing the results of various gels of the present disclosure to evaluate the possible microbial contamination in three different states of their use (intact, in-use, ending product).

[00114] Fig. 97 is a photograph of an embodiment of a foam product of the present disclosure suitable for protection against UV.

[00115] Fig. 98 is a photograph of an embodiment of a viscous liquid of the present disclosure suitable for protection against UV.

[00116] Fig. 99 is a photograph of an embodiment of a viscous liquid of the present disclosure suitable for protection against UV.

[00117] Fig. 100 is a photograph an embodiment of a foam product of the present disclosure suitable for protection against UV.

[00118] Figs. 101 to 107 are photographs showing the process whereby a hyaluronic acid/silk solution is mixed with jojoba oil, rosehip oil, Vitamin E and 5N NaOH to provide a homogenous mixture.

[00119] Fig. 108 is a photograph showing jars containing moisturizer of the invention at Day 1 of a moisturizer shelf-life pilot.

[00120] Fig. 109 is a photograph showing pumps containing moisturizer of the invention at Day 1 of the moisturizer shelf-life pilot.

[00121] Fig. 110 is a photograph showing jars containing moisturizer of the invention at Day 20 of the moisturizer shelf-life pilot.

[00122] Fig. 111 is a photograph showing pumps containing moisturizer of the invention at Day 20 of the moisturizer shelf-life pilot.

[00123] Fig. 112 is a table that includes a description of various exemplary moisturizing compositions.

[00124] While the above-identified drawings set forth presently disclosed embodiments, other embodiments are also contemplated, as noted in the discussion. This disclosure presents illustrative embodiments by way of representation and not limitation. Numerous other modifications and embodiments can be devised by those skilled in the art which fall within the scope and spirit of the principles of the presently disclosed embodiments.

DETAILED DESCRIPTION OF THE INVENTION

Silk Fibroin-Based Protein Fragments

[00125] As used herein, the term "fibroin" includes silk worm fibroin and insect or spider silk protein. In an embodiment, fibroin is obtained from *Bombyx mori*.

[00126] Provided herein are methods for producing pure and highly scalable silk protein fragment (SPF) mixture solutions that may be used across multiple industries for a variety of applications. The solutions are generated from raw pure intact silk protein material and processed in order to remove any sericin and achieve the desired weight average molecular weight (MW) and polydispersity of the fragment mixture. Select method parameters may be altered to achieve distinct final silk protein fragment characteristics depending upon the intended use. The resulting final fragment solution is pure silk protein fragments and water with PPM to non-detectable levels of process contaminants, levels acceptable in the pharmaceutical, medical and consumer cosmetic markets. The concentration, size and polydispersity of silk protein fragments in the solution may farther be altered depending upon the desired use and performance requirements. In an embodiment, the pure silk fibroin-based protein fragments in the solution are substantially devoid of sericin, have an average weight average molecular weight ranging from about 6 kDa to about 16 kDa, and have a polydispersity ranging from about 1.5 and about 3.0. In an embodiment, the pure silk fibroin-based protein fragments in the solution are substantially devoid of sericin, have an average weight average molecular weight ranging from about 17 kDa to about 38 kDa, and have a polydispersity ranging from about 1.5 and about 3.0. In an embodiment, the pure silk fibroin-based protein fragments in the solution are substantially devoid of sericin, have an average weight average molecular weight

ranging from about 39 kDa to about 80 kDa, and have a polydispersity ranging from about 1.5 and about 3.0.

[00127] In an embodiment, a silk solution may be used to generate moisturizing compositions of varying consistencies by varying water content/concentration. Depending on the silk moisturizing composition utilized and the methods for preparing a silk moisturizing composition, various properties are achieved. The moisturizing compositions may be loaded with at least one therapeutic agent and/or at least one molecule.

[00128] As used herein, the terms "substantially sericin free" or "substantially devoid of sericin" refer to silk fibers in which a majority of the sericin protein has been removed. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.01% (w/w) and about 10.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.01% (w/w) and about 9.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.01% (w/w) and about 8.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.01 % (w/w) and about 7.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.01% (w/w) and about 6.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.01% (w w) and about 5.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0%) (w/w) and about 4.0%) (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.05% (w/w) and about 4.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.1% (w/w) and about 4.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 0.5% (w/w) and about 4.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 1.0% (w/w) and about 4.0%> (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 1.5% (w/w) and about 4.0%) (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between

about 2.0% (w/w) and about 4.0%) (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having between about 2.5% (w/w) and about 4.0% (w/w) sericin. In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having a sericin content between about 0.01% (w/w) and about 0.1 % (w/w). In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having a sericin content below about 0.1 % (w/w). In an embodiment, silk fibroin that is substantially devoid of sericin refers to silk fibroin having a sericin content below about 0.05 % (w/w). In an embodiment, when a silk source is added to a boiling (100°C) aqueous solution of sodium carbonate for a treatment time of between about 30 minutes to about 60 minutes, a degumming loss of about 26 wt. % to about 31 wt.% is obtained.

[00129] As used herein, the term "substantially homogeneous" may refer to pure silk fibroin-based protein fragments that are distributed in a normal distribution about an identified molecular weight. As used herein, the term "substantially homogeneous" may refer to an even distribution of additive, for example vitamin C, throughout a composition of the present disclosure.

[00130] As used herein, the term "substantially free of inorganic residuals" means that the composition exhibits residuals of 0.1 % (w/w) or less. In an embodiment, substantially free of inorganic residuals refers to a composition that exhibits residuals of 0.05% (w/w) or less. In an embodiment, substantially free of inorganic residuals refers to a composition that exhibits residuals of 0.01 % (w/w) or less. In an embodiment, the amount of inorganic residuals is between 0 ppm ("non-detectable" or "ND") and 1000 ppm. In an embodiment, the amount of inorganic residuals is ND to about 500 ppm. In an embodiment, the amount of inorganic residuals is ND to about 400 ppm. In an embodiment, the amount of inorganic residuals is ND to about 300 ppm. In an embodiment, the amount of inorganic residuals is ND to about 200 ppm. In an embodiment, the amount of inorganic residuals is ND to about 100 ppm. In an embodiment, the amount of inorganic residuals is between 10 ppm and 1000 ppm.

[00131] As used herein, the term "substantially free of organic residuals" means that the composition exhibits residuals of 0.1 % (w/w) or less, in an embodiment, substantially free of organic residuals refers to a composition that exhibits residuals of 0.05% (w/w) or less. In an embodiment, substantially free of organic residuals refers to a composition that exhibits residuals of

0.01% (w/w) or less. In an embodiment, the amount of organic residuals is between 0 ppm ("non-detectable" or "ND") and 1000 ppm. In an embodiment, the amount of organic residuals is ND to about 500 ppm. In an embodiment, the amount of organic residuals is ND to about 400 ppm. In an embodiment, the amount of organic residuals is ND to about 300 ppm. In an embodiment, the amount of organic residuals is ND to about 200 ppm. In an embodiment, the amount of organic residuals is ND to about 100 ppm. In an embodiment, the amount of organic residuals is between 10 ppm and 1000 ppm.

[00132] Compositions of the present disclosure exhibit "biocompatibility" meaning that the compositions are compatible with living tissue or a living system by not being toxic, injurious, or physiologically reactive and not causing immunological rejection. Such biocompatibility can be evidenced by participants topically applying compositions of the present disclosure on their skin for an extended period of time. In an embodiment, the extended period of time is about 3 days. In an embodiment, the extended period of time is about 7 days, in an embodiment, the extended period of time is about 14 days, in an embodiment, the extended period of time is about 21 days. In an embodiment, the extended period of time is about 30 days. In an embodiment, the extended period of time is selected from the group consisting of about 1 month, about 2 months, about 3 months, about 4 months, about 5 months, about 6 months, about 7 months, about 8 months, about 9 months, about 10 months, about 11 months, about 12 months, and indefinitely.

[00133] Compositions of the present disclosure are "hypoallergenic" meaning that they are relatively unlikely to cause an allergic reaction. Such hypoallergenicity can be evidenced by participants topically applying compositions of the present disclosure on their skin for an extended period of time. In an embodiment, the extended period of time is about 3 days. In an embodiment, the extended period of time is about 7 days. In an embodiment, the extended period of time is about 14 days. In an embodiment, the extended period of time is about 21 days. In an embodiment, the extended period of time is about 30 days. In an embodiment, the extended period of time is selected from the group consisting of about 1 month, about 2 months, about 3 months, about 4 months, about 5 months, about 6 months, about 7 months, about 8 months, about 9 months, about 10 months, about 11 months, about 12 months, and indefinitely.

[00134] Following are non-limiting examples of suitable ranges for various parameters in and for preparation of the silk solutions of the present disclosure. The silk solutions of the present disclosure may include one or more, but not necessarily all, of these parameters and may be prepared using various combinations of ranges of such parameters.

[00135] In an embodiment, the percent silk in the solution is less than 30%. In an embodiment, the percent silk in the solution is less than 25%. In an embodiment, the percent silk in the solution is less than 20%. In an embodiment, the percent silk in the solution is less than 19%. In an embodiment, the percent silk in the solution is less than 18%. In an embodiment, the percent silk in the solution is less than 17%. In an embodiment, the percent silk in the solution is less than 16%. In an embodiment, the percent silk in the solution is less than 15%. In an embodiment, the percent silk in the solution is less than 14%. In an embodiment, the percent silk in the solution is less than 13%. In an embodiment, the percent silk in the solution is less than 12%. In an embodiment, the percent silk in the solution is less than 11%. In an embodiment, the percent silk in the solution is less than 10%. In an embodiment, the percent silk in the solution is less than 9%. In an embodiment, the percent silk in the solution is less than 8%. In an embodiment, the percent silk in the solution is less than 7%. In an embodiment, the percent silk in the solution is less than 6%. In an embodiment, the percent silk in the solution is less than 5%. In an embodiment, the percent silk in the solution is less than 4%. In an embodiment, the percent silk in the solution is less than 3%. In an embodiment, the percent silk in the solution is less than 2%. In an embodiment, the percent silk in the solution is less than 1%. In an embodiment, the percent silk in the solution is less than 0.9%. In an embodiment, the percent silk in the solution is less than 0.8%. In an embodiment, the percent silk in the solution is less than 0.7%. In an embodiment, the percent silk in the solution is less than 0.6%. In an embodiment, the percent silk in the solution is less than 0.5%. In an embodiment, the percent silk in the solution is less than 0.4%. In an embodiment, the percent silk in the solution is less than 0.3%. In an embodiment, the percent silk in the solution is less than 0.2%. In an embodiment, the percent silk in the solution is less than 0.1%. In an embodiment, the percent silk in the solution is greater than 0.1%. In an embodiment, the percent silk in the solution is greater than 0.2%. In an embodiment, the percent silk in the solution is greater than 0.3%. In an embodiment, the percent silk in the solution is greater than 0.4%. In an embodiment, the percent silk in the solution is greater than 0.5%. In an embodiment, the percent silk in the solution is greater than 0.6%. In an embodiment, the percent silk

in the solution is greater than 0.7%. In an embodiment, the percent silk in the solution is greater than 0.8%. In an embodiment, the percent silk in the solution is greater than 0.9%. In an embodiment, the percent silk in the solution is greater than 1%. In an embodiment, the percent silk in the solution is greater than 2%. In an embodiment, the percent silk in the solution is greater than 3%. In an embodiment, the percent silk in the solution is greater than 4%. In an embodiment, the percent silk in the solution is greater than 5%. In an embodiment, the percent silk in the solution is greater than 6%. In an embodiment, the percent silk in the solution is greater than 7%. In an embodiment, the percent silk in the solution is greater than 8%. In an embodiment, the percent silk in the solution is greater than 9%. In an embodiment, the percent silk in the solution is greater than 10%. In an embodiment, the percent silk in the solution is greater than 11%. In an embodiment, the percent silk in the solution is greater than 12%. In an embodiment, the percent silk in the solution is greater than 13%. In an embodiment, the percent silk in the solution is greater than 14%. In an embodiment, the percent silk in the solution is greater than 15%. In an embodiment, the percent silk in the solution is greater than 16%. In an embodiment, the percent silk in the solution is greater than 17%. In an embodiment, the percent silk in the solution is greater than 18%. In an embodiment, the percent silk in the solution is greater than 19%. In an embodiment, the percent silk in the solution is greater than 20%. In an embodiment, the percent silk in the solution is greater than 25%. In an embodiment, the percent silk in the solution is between 0.1% and 30%. In an embodiment, the percent silk in the solution is between 0.1% and 25%. In an embodiment, the percent silk in the solution is between 0.1% and 20%. In an embodiment, the percent silk in the solution is between 0.1% and 15%. In an embodiment, the percent silk in the solution is between 0.1% and 10%. In an embodiment, the percent silk in the solution is between 0.1% and 9%. In an embodiment, the percent silk in the solution is between 0.1% and 8%. In an embodiment, the percent silk in the solution is between 0.1% and 7%. In an embodiment, the percent silk in the solution is between 0.1% and 6.5%. In an embodiment, the percent silk in the solution is between 0.1% and 6%. In an embodiment, the percent silk in the solution is between 0.1% and 5.5%. In an embodiment, the percent silk in the solution is between 0.1% and 5%. In an embodiment, the percent silk in the solution is between 0.1% and 4.5%. In an embodiment, the percent silk in the solution is between 0.1% and 4%. In an embodiment, the percent silk in the solution is between 0.1% and 3.5%. In an embodiment, the percent silk in the solution is between 0.1% and 3%. In an embodiment, the percent silk in the

solution is between 0.1% and 2.5%. In an embodiment, the percent silk in the solution is between 0.1% and 2.0%. In an embodiment, the percent silk in the solution is between 0.1% and 2.4%. In an embodiment, the percent silk in the solution is between 0.5% and 5%. In an embodiment, the percent silk in the solution is between 0.5% and 4.5%. In an embodiment, the percent silk in the solution is between 0.5% and 4%. In an embodiment, the percent silk in the solution is between 0.5% and 3.5%. In an embodiment, the percent silk in the solution is between 0.5% and 3%. In an embodiment, the percent silk in the solution is between 0.5% and 2.5%. In an embodiment, the percent silk in the solution is between 1 and 4%. In an embodiment, the percent silk in the solution is between 1 and 3.5%. In an embodiment, the percent silk in the solution is between 1 and 3%. In an embodiment, the percent silk in the solution is between 1 and 2.5%. In an embodiment, the percent silk in the solution is between 1 and 2.4%. In an embodiment, the percent silk in the solution is between 1 and 2%. In an embodiment, the percent silk in the solution is between 20% and 30%. In an embodiment, the percent silk in the solution is between 0.1% and 10%. In an embodiment, the percent silk in the solution is between 1% and 10%. In an embodiment, the percent silk in the solution is between 2% and 10%. In an embodiment, the percent silk in the solution is between 0.1% and 6%. In an embodiment, the percent silk in the solution is between 6% and 10%. In an embodiment, the percent silk in the solution is between 6% and 8%. In an embodiment, the percent silk in the solution is between 6% and 9%. In an embodiment, the percent silk in the solution is between 10% and 20%. In an embodiment, the percent silk in the solution is between 11% and 19%. In an embodiment, the percent silk in the solution is between 12% and 18%. In an embodiment, the percent silk in the solution is between 13% and 17%. In an embodiment, the percent silk in the solution is between 14% and 16%. In an embodiment, the percent silk in the solution is about 1%. In an embodiment, the percent silk in the solution is about 1.5%. In an embodiment, the percent silk in the solution is about 2%. In an embodiment, the percent silk in the solution is about 2.4%. In an embodiment, the percent silk in the solution is 3%. In an embodiment, the percent silk in the solution is 3.5%. In an embodiment, the percent silk in the solution is about 4%. In an embodiment, the percent silk in the solution is about 4.5%. In an embodiment, the percent silk in the solution is about 5%. In an embodiment, the percent silk in the solution is about 5.5%. In an embodiment the percent silk in the solution is about 6%. In an embodiment, the percent silk in the solution is about 6.5%. In an embodiment, the percent silk in the solution is about 7%. In an embodiment, the percent

silk in the solution is about 7.5%. In an embodiment, the percent silk in the solution is about 8%. In an embodiment, the percent silk in the solution is about 8.5%. In an embodiment, the percent silk in the solution is about 9%. In an embodiment, the percent silk in the solution is about 9.5%. In an embodiment, the percent silk in the solution is about 10%.

[00136] In an embodiment, the percent sericin in the solution is non-detectable to 30%. In an embodiment, the percent sericin in the solution is non-detectable to 5%. In an embodiment, the percent sericin in the solution is 1%. In an embodiment, the percent sericin in the solution is 2%. In an embodiment, the percent sericin in the solution is 3%. In an embodiment, the percent sericin in the solution is 4%. In an embodiment, the percent sericin in the solution is 5%. In an embodiment, the percent sericin in the solution is 10%. In an embodiment, the percent sericin in the solution is 30%.

[00137] In an embodiment, the stability of the LiBr-silk fragment solution is 0 to 1 year. In an embodiment, the stability of the LiBr-silk fragment solution is 0 to 2 years. In an embodiment, the stability of the LiBr-silk fragment solution is 0 to 3 years. In an embodiment, the stability of the LiBr-silk fragment solution is 0 to 4 years. In an embodiment, the stability of the LiBr-silk fragment solution is 0 to 5 years. In an embodiment, the stability of the LiBr-silk fragment solution is 1 to 2 years. In an embodiment, the stability of the LiBr-silk fragment solution is 1 to 3 years. In an embodiment, the stability of the LiBr-silk fragment solution is 1 to 4 years. In an embodiment, the stability of the LiBr-silk fragment solution is 1 to 5 years. In an embodiment, the stability of the LiBr-silk fragment solution is 2 to 3 years. In an embodiment, the stability of the LiBr-silk fragment solution is 2 to 4 years. In an embodiment, the stability of the LiBr-silk fragment solution is 2 to 5 years. In an embodiment, the stability of the LiBr-silk fragment solution is 3 to 4 years. In an embodiment, the stability of the LiBr-silk fragment solution is 3 to 5 years. In an embodiment, the stability of the LiBr-silk fragment solution is 4 to 5 years.

[00138] In an embodiment, the stability of a composition of the present disclosure is 10 days to 6 months. In an embodiment, the stability of a composition of the present disclosure is 6 months to 12 months. In an embodiment, the stability of a composition of the present disclosure is 12 months to 18 months. In an embodiment, the stability of a composition of the present disclosure is 18 months to 24 months. In an embodiment, the stability of a composition of the present disclosure is 24

months to 30 months. In an embodiment, the stability of a composition of the present disclosure is 30 months to 36 months. In an embodiment, the stability of a composition of the present disclosure is 36 months to 48 months. In an embodiment, the stability of a composition of the present disclosure is 48 months to 60 months.

[00139] In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 6 kDa to 16 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 17 kDa to 38 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 39 kDa to 80 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 1 to 5 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 5 to 10 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 10 to 15 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 15 to 20 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 20 to 25 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 25 to 30 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 30 to 35 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 35 to 40 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 40 to 45 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 45 to 50 kDa. In an

embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 50 to 55 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 55 to 60 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 60 to 65 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 65 to 70 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 70 to 75 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 75 to 80 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 80 to 85 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 85 to 90 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 90 to 95 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 95 to 100 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 100 to 105 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 105 to 110 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 110 to 115 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 115 to 120 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 120 to 125 kDa. In an

embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 125 to 130 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 130 to 135 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 135 to 140 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 140 to 145 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 145 to 150 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 150 to 155 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 155 to 160 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 160 to 165 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 165 to 170 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 170 to 175 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 175 to 180 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 180 to 185 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 185 to 190 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 190 to 195 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 195 to 200 kDa. In an

embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 200 to 205 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 205 to 210 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 210 to 215 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 215 to 220 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 220 to 225 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 225 to 230 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 230 to 235 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 235 to 240 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 240 to 245 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 245 to 250 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 250 to 255 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 255 to 260 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 260 to 265 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 265 to 270 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 270 to 275 kDa. In an

embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 275 to 280 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 280 to 285 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 285 to 290 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 290 to 295 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 295 to 300 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 300 to 305 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 305 to 310 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 310 to 315 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 315 to 320 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 320 to 325 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 325 to 330 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 330 to 335 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 350 to 340 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 340 to 345 kDa. In an embodiment, a composition of the present disclosure includes pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from 345 to 350 kDa.

[00140] In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments has a polydispersity ranging from about 1 to about 5.0, In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments has a polydispersity ranging from about 1.5 to about 3.0. In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments has a polydispersity ranging from about 1 to about 1.5. In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments has a polydispersity ranging from about 1.5 to about 2.0. In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments has a polydispersity ranging from about 2.0 to about 2.5. In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments, has a polydispersity ranging from about is 2.0 to about 3.0. In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments, has a polydispersity ranging from about is 2.5 to about 3.0.

[00141] In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments has non-detectable levels of LiBr residuals. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is between 10ppm and 1000ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is between 10ppm and 300ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 25ppm. In an embodiment, the amount of the Li Br residuals in a composition of the present disclosure is less than 50ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 75ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than l00ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 200ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 300ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 400ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 500ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 600ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 700ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 800ppm. In an embodiment, the amount of the LiBr residuals in a

composition of the present disclosure is less than 900ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is less than 1000ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 500ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 450ppm. In an embodiment, the amount of the LiBr residuais in a composition of the present disclosure is non-detectable to 400ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 350ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 300ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 250ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 200ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 150ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is non-detectable to 100ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is 100ppm to 200ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is 200ppm to 300ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is 300ppm to 400ppm. In an embodiment, the amount of the LiBr residuals in a composition of the present disclosure is 400ppm to 500ppm.

[00142] In an embodiment, a composition of the present disclosure having pure silk fibroin-based protein fragments, has non-detectable levels of Na_2CO_3 residuals. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 100ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 200ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 300ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 400ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 500ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 600ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 700ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than 800 ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a

composition of the present disclosure is less than 900 ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is less than l000 ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 500ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 450 ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 400 ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 350ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 300ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 250ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 200ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to 150ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is non-detectable to l00ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is l00ppm to 200ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is 200ppm to 300ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is 300 ppm to 400 ppm. In an embodiment, the amount of the Na_2CO_3 residuals in a composition of the present disclosure is 400 ppm to 500 ppm.

[00143] In an embodiment, the water solubility of pure silk fibroin-based protein fragments of the present disclosure is 50 to 100%. In an embodiment, the water solubility of pure silk fibroin-based protein fragments of the present disclosure is 60 to 100%. In an embodiment, the water solubility of pure silk fibroin-based protein fragments of the present disclosure is 70 to 100%. In an embodiment, the water solubility of pure silk fibroin-based protein fragments of the present disclosure is 80 to 100%. In an embodiment, the water solubility is 90 to 100%. In an embodiment, the silk fibroin-based fragments of the present disclosure are non-soluble in aqueous solutions.

[00144] In an embodiment, the solubility of pure silk fibroin-based protein fragments of the present disclosure in organic solutions is 50 to 100%. In an embodiment, the solubility of pure silk fibroin-based protein fragments of the present disclosure in organic solutions is 60 to 100%. In an

embodiment, the solubility of pure silk fibroin-based protein fragments of the present disclosure in organic solutions is 70 to 100%. In an embodiment, the solubility of pure silk fibroin-based protein fragments of the present disclosure in organic solutions is 80 to 100%. In an embodiment, the solubility of pure silk fibroin-based protein fragments of the present disclosure in organic solutions is 90 to 100%. In an embodiment, the silk fibroin-based fragments of the present disclosure are non-soluble in organic solutions.

[00145] In an embodiment, the percent water content in gels of the present disclosure is 20% to 99.9%. In an embodiment, the percent water content in gels of the present disclosure is 20% to 25%. In an embodiment, the percent water content in gels of the present disclosure is 25% to 30%. In an embodiment, the percent water content in gels of the present disclosure is 30% to 35%. In an embodiment, the percent water content in gels of the present disclosure is 35% to 40%. In an embodiment, the percent water content in gels of the present disclosure is 40% to 45%. In an embodiment, the percent water content in gels of the present disclosure is 45% to 50%. in an embodiment, the percent water content in gels of the present disclosure is 50% to 55%. In an embodiment, the percent water content in gels of the present disclosure is 55% to 60%. In an embodiment, the percent water content in gels of the present disclosure is 60% to 65%. In an embodiment, the percent water content in gels of the present disclosure is 65% to 70%. In an embodiment, the percent water content in gels of the present disclosure is 70% to 75%. In an embodiment, the percent water content in gels of the present disclosure is 75% to 80%. In an embodiment, the percent water content in gels of the present disclosure is 80% to 85%. In an embodiment, the percent water content in gels of the present disclosure is 85% to 90%. In an embodiment, the percent water content in gels of the present disclosure is 90% to 95%. In an embodiment, the percent water content in gels of the present disclosure is 95% to 99%.

[00146] In an embodiment, the percent water content in films of the present disclosure is 20%. In an embodiment, the percent water content in films of the present disclosure is less than 20%). In an embodiment, the percent water content in films of the present disclosure is less than 18%. In an embodiment, the percent water content in films of the present disclosure is less than 16%. In an embodiment, the percent water content in films of the present disclosure is less than 14%. In an embodiment, the percent water content in films of the present disclosure is less than 12%. In an

embodiment, the percent water content in films of the present disclosure is less than 10%. In an embodiment, the percent water content in films of the present disclosure is between about 2% and about 20%.

[00147] In an embodiment, the percent water content in moisturizing compositions of the present disclosure is about 70% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is about 75% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is about 80% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 99% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 95% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 90% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 85% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 80% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 78% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 75% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 73% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is less than 70% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is between about 70% (w/v) and about 99% (w/v). In an embodiment, the percent water content in films of the present disclosure is between about 70% (w/v) and about 90% (w/v). In an embodiment, the percent water content in moisturizing compositions of the present disclosure is between about 70% (w/v) and about 80% (w/v).

[00148] In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.02% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.04% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.06% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.08% (w/v). In an

embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.1% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.12% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.14% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.16% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.18% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is about 0.2% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 6% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 2% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 1% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 0.5% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 0.2% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 0.18% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 0.14% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is less than 0.1% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is between about 0.001% (w/v) and about 6% (w/v). In an embodiment, the percent silk protein fragments content in films of the present disclosure is between about 0.01% (w/v) and about 2% (w/v). In an embodiment, the percent silk protein fragments content in moisturizing compositions of the present disclosure is between about 0.06% (w/v) and about 0.2% (w/v).

[00149] In an embodiment, a solution of the present disclosure is used to create an article with microneedles by standard methods known to one in the art for controlled delivery of molecules or therapeutic agents to or through the skin.

[00150] A method for preparing an aqueous solution of pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from about 6 kDa to about 16 kDa includes the steps of: degumming a silk source by adding the silk source to a boiling (100°C) aqueous solution of sodium carbonate for a treatment time of between about 30 minutes to about 60 minutes; removing sericin from the solution to produce a silk fibroin extract comprising non-detectable levels of sericin; draining the solution from the silk fibroin extract; dissolving the silk fibroin extract in a solution of lithium bromide having a starting temperature upon placement of the silk fibroin extract in the lithium bromide solution that ranges from about 60°C to about 140°C; maintaining the solution of silk fibroin-lithium bromide in an oven having a temperature of about 140°C for a period of at least 1 hour; removing the lithium bromide from the silk fibroin extract; and producing an aqueous solution of silk protein fragments, the aqueous solution comprising: fragments having an average weight average molecular weight ranging from about 6 kDa to about 16 kDa, and wherein the aqueous solution of pure silk fibroin-based protein fragments comprises a polydispersity of between about 1.5 and about 3.0. The method may further comprise drying the silk fibroin extract prior to the dissolving step. The aqueous solution of pure silk fibroin-based protein fragments may comprise lithium bromide residuals of less than 300 ppm as measured using a high-performance liquid chromatography lithium bromide assay. The aqueous solution of pure silk fibroin-based protein fragments may comprise sodium carbonate residuals of less than 100 ppm as measured using a high-performance liquid chromatography sodium carbonate assay. The method may further comprise adding a therapeutic agent to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding a molecule selected from one of an antioxidant or an enzyme to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding a vitamin to the aqueous solution of pure silk fibroin-based protein fragments. The vitamin may be vitamin C or a derivative thereof. The aqueous solution of pure silk fibroin-based protein fragments may be lyophilized. The method may further comprise adding an alpha hydroxy acid to the aqueous solution of pure silk fibroin-based protein fragments. The alpha hydroxy acid may be selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. The method may further comprise adding hyaluronic acid or its salt form at a concentration of about 0.5% to about 10.0% to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding at least one of zinc oxide or titanium

dioxide. A film may be fabricated from the aqueous solution of pure silk fibroin-based protein fragments produced by this method. The film may comprise from about 1.0 wt. % to about 50,0 wt. % of vitamin C or a derivative thereof. The film may have a water content ranging from about 2.0 wt. % to about 20.0 wt. %. The film may comprise from about 30.0 wt. % to about 99.5 wt. % of pure silk fibroin-based protein fragments. A gel may be fabricated from the aqueous solution of pure silk fibroin-based protein fragments produced by this method. The gel may comprise from about 0.5 wt. % to about 20.0 wt. % of vitamin C or a derivative thereof. The gel may have a silk content of at least 2% and a vitamin content of at least 20%.

[00151] A method for preparing an aqueous solution of pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from about 17 kDa to about 38 kDa includes the steps of: adding a silk source to a boiling (100°C) aqueous solution of sodium carbonate for a treatment time of between about 30 minutes to about 60 minutes so as to result in degumming; removing sericin from the solution to produce a silk fibroin extract comprising non-detectable levels of sericin; draining the solution from the silk fibroin extract; dissolving the silk fibroin extract in a solution of lithium bromide having a starting temperature upon placement of the silk fibroin extract in the lithium bromide solution that ranges from about 80°C to about 140°C; maintaining the solution of silk fibroin-lithium bromide in a dry oven having a temperature in the range between about 60°C to about 100°C for a period of at least 1 hour; removing the lithium bromide from the silk fibroin extract; and producing an aqueous solution of pure silk fibroin-based protein fragments, wherein the aqueous solution of pure silk fibroin-based protein fragments comprises lithium bromide residuals of between about 10 ppm and about 300 ppm, wherein the aqueous solution of silk protein fragments comprises sodium carbonate residuals of between about 10 ppm and about 100 ppm, wherein the aqueous solution of pure silk fibroin-based protein fragments comprises fragments having an average weight average molecular weight ranging from about 17 kDa to about 38 kDa, and wherein the aqueous solution of pure silk fibroin-based protein fragments comprises a polydispersity of between about 1.5 and about 3.0. The method may further comprise drying the silk fibroin extract prior to the dissolving step. The aqueous solution of pure silk fibroin-based protein fragments may comprise lithium bromide residuals of less than 300 ppm as measured using a high-performance liquid chromatography lithium bromide assay. The aqueous solution of pure silk fibroin-based protein fragments may comprise sodium carbonate residuals of less than 100 ppm as

measured using a high-performance liquid chromatography sodium carbonate assay. The method may further comprise adding a therapeutic agent to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding a molecule selected from one of an antioxidant or an enzyme to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding a vitamin to the aqueous solution of pure silk fibroin-based protein fragments. The vitamin may be vitamin C or a derivative thereof. The aqueous solution of pure silk fibroin-based protein fragments may be lyophilized. The method may further comprise adding an alpha hydroxy acid to the aqueous solution of pure silk fibroin-based protein fragments. The alpha hydroxy acid may be selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. The method may further comprise adding hyaluronic acid or its salt form at a concentration of about 0.5% to about 10.0% to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding at least one of zinc oxide or titanium dioxide. A film may be fabricated from the aqueous solution of pure silk fibroin-based protein fragments produced by this method. The film may comprise from about 1 ,0 wt. % to about 50.0 wt. % of vitamin C or a derivative thereof. The film may have a water content ranging from about 2.0 wt. % to about 20.0 wt. %. The film may comprise from about 30.0 wt. % to about 99.5 wt. % of pure silk fibroin-based protein fragments. A gel may be fabricated from the aqueous solution of pure silk fibroin-based protein fragments produced by this method. The gel may comprise from about 0.5 wt. % to about 20.0 wt. % of vitamin C or a derivative thereof. The gel may have a silk content of at least 2% and a vitamin content of at least 20%.

[00152] According to aspects illustrated herein, there is disclosed a method for preparing an aqueous solution of pure silk fibroin-based protein fragments having an average weight average molecular weight ranging from about 39 kDa to about 80 kDa, the method including the steps of: adding a silk source to a boiling (100°C) aqueous solution of sodium carbonate for a treatment time of about 30 minutes so as to result in degumming; removing sericin from the solution to produce a silk fibroin extract comprising non-detectable levels of sericin; draining the solution from the silk fibroin extract; dissolving the silk fibroin extract in a solution of lithium bromide having a starting temperature upon placement of the silk fibroin extract in the lithium bromide solution that ranges from about 80°C to about 140°C; maintaining the solution of silk fibroin-lithium bromide in a dry oven having a temperature in the range between about 60°C to about 100°C for a period of at least 1

hour; removing the lithium bromide from the silk fibroin extract; and producing an aqueous solution of pure silk fibroin-based protein fragments, wherein the aqueous solution of pure silk fibroin-based protein fragments comprises lithium bromide residuals of between about 10 ppm and about 300 ppm, sodium carbonate residuals of between about 10 ppm and about 100 ppm, fragments having an average weight average molecular weight ranging from about 40 kDa to about 65 kDa, and wherein the aqueous solution of pure silk fibroin-based protein fragments comprises a polydispersity of between about 1.5 and about 3.0. The method may further comprise drying the silk fibroin extract prior to the dissolving step. The aqueous solution of pure silk fibroin-based protein fragments may comprise lithium bromide residuals of less than 300 ppm as measured using a high-performance liquid chromatography lithium bromide assay. The aqueous solution of pure silk fibroin-based protein fragments may comprise sodium carbonate residuals of less than 100 ppm as measured using a high-performance liquid chromatography sodium carbonate assay.

[00153] The method may further comprise adding a therapeutic agent to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding a molecule selected from one of an antioxidant or an enzyme to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding a vitamin to the aqueous solution of pure silk fibroin-based protein fragments. The vitamin may be vitamin C or a derivative thereof. The aqueous solution of pure silk fibroin-based protein fragments may be lyophilized. The method may further comprise adding an alpha hydroxy acid to the aqueous solution of pure silk fibroin-based protein fragments. The alpha hydroxy acid may be selected from the group consisting of glycolic acid, lactic acid, tartaric acid and citric acid. The method may further comprise adding hyaluronic acid or its salt form at a concentration of about 0.5% to about 10.0% to the aqueous solution of pure silk fibroin-based protein fragments. The method may further comprise adding at least one of zinc oxide or titanium dioxide. A film may be fabricated from the aqueous solution of pure silk fibroin-based protein fragments produced by this method. The film may comprise from about 1.0 wt. % to about 50.0 wt. % of vitamin C or a derivative thereof. The film may have a water content ranging from about 2.0 wt. % to about 20.0 wt. %. The film may comprise from about 30.0 wt. % to about 99.5 wt. % of pure silk fibroin-based protein fragments. A gel may be fabricated from the aqueous solution of pure silk fibroin-based protein fragments produced by this method. The gel may

comprise from about 0,5 wt. % to about 20.0 wt, % of vitamin C or a derivative thereof. The gel may have a silk content of at least 2% and a vitamin content of at least 20%.

[00154] In an embodiment, the compositions of the invention include one or more emollients. Examples of emollients that may be included in the compositions of the invention are as follows:

(1) hydrocarbon oils and waxes such as mineral oil, petrolatum, paraffin, ozokerite, microcrystalline wax, polyethylene, squalene, and perhydrosqualene;

(2) silicone oils, such as dimethyl polysiloxanes, methylphenyl polysiloxanes, water-soluble and alcohol-soluble silicone glycol copolymers;

(3) acetoglyceride esters, such as acetylated monoglycerides;

(4) ethoxylated glycerides, such as ethoxylated glyceryl monostearate;

(5) alkyl esters of fatty acids having 10 to 20 carbon atoms such as alkyl esters, which may include hexyl laurate, isohexyl laurate, isohexyl palmitate, isopropyl palmitate, decyl oleate, isodecyl oleate, hexadecyl stearate, decyl stearate, isopropyl isostearate, diisopropyl adipate, diisohexyl adipate, dihexyldecyl adipate, diisopropyl sebacate, lauryl lactate, myristyl lactate, and cetyl lactate, including methyl, isopropyl, and butyl esters of fatty acids;

(6) alkenyl esters of fatty acids having 10 to 20 carbon atoms such as oleyl myristate, oleyl stearate, and oleyl oleate;

(7) fatty acids having 10 to 20 carbon atoms such as pelargonic, lauric, myristic, palmitic, stearic, isostearic, hydroxystearic, oleic, linoleic, ricinoleic, arachidic, behenic, and erucic acids;

(8) fatty alcohols having 10 to 20 carbon atoms such as lauryl, myristyl, cetyl, hexadecyl, stearyl, isostearyl, hydroxystearyl, oleyl, ricinoleyl, behenyl, erucyl alcohols, and 2-octyl dodecanol;

(9) fatty alcohols ethers including ethoxylated fatty alcohols of 10 to 20 carbon atoms such as the lauryl, cetyl, stearyl, isostearyl, oelyl, and cholesterol alcohols having attached thereto from 1 to 50 ethylene oxide groups or 1 to 50 propylene oxide groups;

(10) ether-esters such as fatty acid esters of ethoxylated fatty alcohols;

(11) lanolin and its derivatives such as lanolin oil, lanolin wax, lanolin alcohols, lanolin fatty acids, isopropyl lanolate, ethoxylated lanolin, ethoxylated lanolin alcohols, ethoxylated cholesterol, propoxylated lanolin alcohols, acetylated lanolin, acetylated lanolin alcohols, lanolin alcohols linoleate, lanolin alcohols ricinoleate, acetate of lanolin alcohols ricinoleate, acetate of ethoxylated

alcohols-esters, hydrogenolysis of lanolin, ethoxylated hydrogenated lanolin, ethoxylated sorbitol lanolin, and liquid and semisolid lanolin absorption bases;

(12) polyhydric alcohols and polyether derivatives such as propylene glycol, dipropylene glycol, polypropylene glycols 2000 and 4000, polyoxyethylene polyoxyethylene glycols, polyoxypropylene polyoxyethylene glycols, glycerol, sorbitol, ethoxylated sorbitol, hydroxypropyl sorbitol, polyethylene glycols 200-6000, methoxy polyethylene glycols 350, 550, 750, 2000 and 5000, poly[ethylene oxide]homopolymers (100,000-5,000,000), polyalkylene glycols and derivatives, hexylene glycol (2-methyl-2,4-pentanediol), 1,3-butylene glycol, 1,2,6-hexanetriol, ethohexadiol USP (2-ethyl-1,3-hexanediol), C15-C18 vicinal glycol, and polyoxypropylene derivatives of trimethylolpropane;

(13) polyhydric alcohol esters including ethylene glycol mono- and di-fatty acid esters, diethylene glycol mono- and di-fatty acid esters, polyethylene glycol (200-6000) mono- and di-fatty acid esters, propylene glycol mono- and di-fatty acid esters, polypropylene glycol 2000 monooleate, polypropylene glycol 2000 monostearate, ethoxylated propylene glycol monostearate, glyceryl mono- and di-fatty acid esters, polyglycerol poly-fatty acid esters, ethoxylated glyceryl monostearate, 1,3-butylene glycol monostearate, 1,3-butylene glycol distearate, polyoxyethylene polyol fatty acid ester, sorbitan fatty acid esters, and polyoxyethylene sorbitan fatty acid esters;

(14) wax esters such as beeswax, spermaceti, myristyl myristate, and stearyl stearate;

(15) beeswax derivatives, such as polyoxyethylene sorbitol beeswax which are reaction products of beeswax with ethoxylated sorbitol of varying ethylene oxide content, forming a mixture of ether-esters;

(16) vegetable waxes including carnauba and candelilla waxes;

(17) natural or essential oils, including, vegetable oil, citrus oil, plant oil, fish oil, non-citrus fruit oil, nut oils, oils having flavors, perfume or scents; vegetable oils may include canola oil, corn oil, neem oil, olive oil, cottonseed oil, coconut oil, fractionated coconut oil, palm oil, nut oils, safflower oil, sesame oil, soybean oil, and sunflower oil; nut oils can be peanut oil, almond oil, cashew oil, hazelnut oil, macadamia oil, pecan oil, pine nut oil, pistachio oil, and walnut oil; citrus oils may include grapefruit seed oil, lemon oil, orange oil, sweet orange oil, tangerine oil, lime oil, mandarin oil, and the like; other natural or essential oils may include fish oil such as omega 3 oil, flaxseed oil (linseed oil), apricot oil, avocado oil, carrot oil, cocoa butter oil, coconut oil,

fractionated coconut oil, hemp oil, papaya seed oil, rice bran oil, shea butter oil, tea tree seed oil, and wheat germ oil; additional natural or essential oils may include lavender oil, rosemary oil, tung oil, jojoba oil, poppy seed oil, shea butter, castor oil, mango oil, rose hip oil, tall oil; and natural or essential oils may include chamomile oil, cinnamon oil, citronella oil, eucalyptus oil, fennel seed oil, jasmine oil, juniper berry oil, raspberry seed oil, lavender oil, primrose oil, lemon grass oil, nutmeg oil, patchouli oil, peppermint oil, pine oil, rose oil, rose hip oil, rosemary oil, eucalyptus oil, tea tree oil, rosewood oil, sandalwood oil, sassafras oil, spearmint oil, and wintergreen oil;

(18) phospholipids, such as lecithin and derivatives;

(19) sterols such as cholesterol and cholesterol fatty acid esters; and

(20) amides such as fatty acid amides, ethoxylated fatty acid amides, and solid fatty acid alkanolamides. Examples of emollients that may be included in the compositions of the invention may include one or more of ricinus communis (castor) seed oil, lanolin, aloe barbadensis leaf extract, therbroma cacao (cocoa) seed butter, petrolatum, euphorbia cerifera (candelilla) wax, honey, gerniol, menthol, camphor, cetyl esters, mineral oil, salicylic acid, lavandula angustifolia (lavender) flower extract, phenol, olea europaea (olive) oil, camellia sinensis (green tea) seed oil, prunus armeniacea (acai) fruit oil, persea gratissima (avocado) oil, vegetable oil, palmitoyl isoleucine, sambucus nigra (elderberry) fruit extract, phoenix dactylifera (date) seed extract, avandula stoechas (spanish lavender) exract, spiraea ulmaria (meadowsweet) leave extract, chamomilla recutita (chamomile) leaf extract, and symphytum officinale (comfrey) leaf extract.

[00155] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of about 50 wt. %, about 45 wt. %, about 40 wt. %, about 35 wt. %, about 30 wt. %, about 25 wt. %, about 20 wt. %, about 19.75 wt. %, about 19.50 wt. %, about 19.25 wt. %, about 19 wt. %, about 18.75 wt. %, about 18.50 wt. %, about 18.25 wt. %, about 18 wt. %, about 17.75 wt. %, about 17.50 wt. %, about 17.25 wt. %, about 17 wt. %, about 16.75 wt. %, about 16.50 wt. %, about 16.25 wt. % about 16 wt. %, about 15.75 wt. %, about 15.50 wt. %, about 15.25 wt. %, about 15 wt. %, about 14.75 wt. %, about 14.50 wt. %, about 14.25 wt. %, about 14 wt. %, about 13.75 wt. %, about 13.50 wt. %, about 13.25 wt. %, about 13 wt. %, about 12.75 wt. %, about 12.50 wt. %, about 12.25 wt. %, about 12 wt. %, about 11.75 wt. %, about 11.50 wt. %, about 11.25 wt. %, about 11 wt. %, about 10.75 wt. %, about 10.50 wt. %, about 10.25 wt. %, about 10 wt. %, about 9.75 wt. %, about 9.50 wt. %, about 9.25 wt. %, about 9 wt. %, about 8.75 wt. %, about

8.50 wt. %, about 8.25 wt. %, about 8 wt. %, about 7.75 wt. %, about 7.50 wt. %, about 7.25 wt. %, about 7 wt. %, about 6.75 wt. %, about 6.50 wt. %, about 6.25 wt. %, about 6 wt. %, about 5.75 wt. %, about 5.50 wt. %, about 5.25 wt. %, about 5 wt. %, about 4.75 wt. %, about 4.50 wt. %, about 4.25 wt. %, about 4 wt. %, about 3.75 wt. %, about 3.50 wt. %, about 3.25 wt. %, about 3 wt. %, about 2.75 wt. %, about 2.50 wt. %, about 2.25 wt. %, about 2 wt. %, about 1.75 wt. %, about 1.50 wt. %, about 1.25 wt. %, about 1 wt. %, about 0.5 wt. %, about 0.4 wt. %, about 0.3 wt. %, about 0.2 wt. %, about 0.1 wt. %, about 0.09 wt. %, about 0.08 wt. %, about 0.07 wt. %, about 0.06 wt. %, about 0.05 wt. %, about 0.04 wt. %, about 0.03 wt. %, about 0.02 wt. %, about 0.01 wt. %, about 0.009 wt. %, about 0.008 wt. %, about 0.007 wt. %, about 0.006 wt. %, about 0.005 wt. %, about 0.004 wt. %, about 0.003 wt. %, about 0.002 wt. %, or about 0.001 wt. %.

[00156] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of between about 1 wt. % to about 50 wt. %, between about 2 wt. % to about 40 wt. %, between about 3 wt. % to about 30 wt. %, between about 4 wt. % to about 20 wt. %, between about 5 wt. % to about 15 wt. %, between about 6 wt. % to about 10 wt. %, between about 7 wt. % to about 9 wt. %, between about 10 wt. % to about 50 wt. %, between about 15 wt. % to about 45 wt. %, between about 20 wt. % to about 40 wt. %, between about 25 wt. % to about 35 wt. %, or between about 25 wt. % to about 30 wt. %.

[00157] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of between about 0.001 wt. % to about 5 wt. %, between about 5 wt. % to about 10 wt. %, between about 10 wt. % to about 15 wt. %, between about 15 wt. % to about 20 wt. %, between about 20 wt. % to about 25 wt. %, between about 25 wt. % to about 30 wt. %, between about 30 wt. % to about 35 wt. %, between about 35 wt. % to about 40 wt. %, between about 40 wt. % to about 45 wt. %, or between about 45 wt. % to about 50 wt. %.

[00158] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of between about 0.001 wt. % to about 1 wt. %, between about 1 wt. % to about 2 wt. %, between about 2 wt. % to about 3 wt. %, between about 3 wt. % to about 4 wt. %, between about 4 wt. % to about 5 wt. %, between about 5 wt. % to about 6 wt. %, between about 6 wt. % to about 7 wt. %, between about 7 wt. % to about 8 wt. %, between about 8 wt. % to about 9 wt. %, between about 9 wt. % to about 10 wt. %, between about 10 wt. % to about 11 wt. %,

between about 11 wt. % to about 12 wt. %, between about 12 wt. % to about 13 wt. %, between about 13 wt. % to about 14 wt. %, between about 14 wt. % to about 15 wt. %, between about 15 wt. % to about 16 wt. %, between about 16 wt. % to about 17 wt. %, between about 17 wt. % to about 18 wt. %, between about 18 wt. % to about 19 wt. %, between about 19 wt. % to about 20 wt. %, between about 20 wt. % to about 21 wt. %, between about 21 wt. % to about 22 wt. %, between about 22 wt. % to about 23 wt. %, between about 23 wt. % to about 24 wt. %, between about 24 wt. % to about 25 wt. %, between about 25 wt. % to about 26 wt. %, between about 26 wt. % to about 27 wt. %, between about 27 wt. % to about 28 wt. %, between about 28 wt. % to about 29 wt. %, between about 29 wt. % to about 30 wt. %, between about 30 wt. % to about 31 wt. %, between about 31 wt. % to about 32 wt. %, between about 32 wt. % to about 33 wt. %, between about 33 wt. % to about 34 wt. %, between about 34 wt. % to about 35 wt. %, between about 35 wt. % to about 36 wt. %, between about 36 wt. % to about 37 wt. %, between about 37 wt. % to about 38 wt. %, between about 38 wt. % to about 39 wt. %, between about 39 wt. % to about 40 wt. %, between about 40 wt. % to about 41 wt. %, between about 41 wt. % to about 42 wt. %, between about 42 wt. % to about 43 wt. %, between about 43 wt. % to about 44 wt. %, between about 44 wt. % to about 45 wt. %, between about 45 wt. % to about 46 wt. %, between about 46 wt. % to about 47 wt. %, between about 47 wt. % to about 48 wt. %, between about 48 wt. % to about 49 wt. %, or between about 49 wt. % to about 50 wt. %.

[00159] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of about 50 wt. %, 45 wt. %, 40 wt. %, 35 wt. %, 30 wt. %, 25 wt. %, 20 wt. %, 19.75 wt. %, 19.50 wt. %, 19.25 wt. %, 19 wt. %, 18.75 wt. %, 18.50 wt. %, 18.25 wt. %, 18 wt. %, 17.75 wt. %, 17.50 wt. %, 17.25 wt. %, 17 wt. %, 16.75 wt. %, 16.50 wt. %, 16.25 wt. % 16 wt. %, 15.75 wt. %, 15.50 wt. %, 15.25 wt. %, 15 wt. %, 14.75 wt. %, 14.50 wt. %, 14.25 wt. %, 14 wt. %, 13.75 wt. %, 13.50 wt. %, 13.25 wt. %, 13 wt. %, 12.75 wt. %, 12.50 wt. %, 12.25 wt. %, 12 wt. %, 11.75 wt. %, 11.50 wt. %, 11.25 wt. %, 11 wt. %, 10.75 wt. %, 10.50 wt. %, 10.25 wt. %, 10 wt. %, 9.75 wt. %, 9.50 wt. %, 9.25 wt. %, 9 wt. %, 8.75 wt. %, 8.50 wt. %, 8.25 wt. %, 8 wt. %, 7.75 wt. %, 7.50 wt. %, 7.25 wt. %, 7 wt. %, 6.75 wt. %, 6.50 wt. %, 6.25 wt. %, 6 wt. %, 5.75 wt. %, 5.50 wt. %, 5.25 wt. %, 5 wt. %, 4.75 wt. %, 4.50 wt. %, 4.25 wt. %, 4 wt. %, 3.75 wt. %, 3.50 wt. %, 3.25 wt. %, 3 wt. %, 2.75 wt. %, 2.50 wt. %, 2.25 wt. %, 2 wt. %, 1.75 wt. %, 1.50 wt. %, 1.25 wt. %, 1 wt. %, 0.5 wt. %, 0.4 wt. %, 0.3 wt. %, 0.2 wt. %, 0.1 wt. %, 0.09 wt. %, 0.08

wt. %, 0.07 wt. %, 0.06 wt. %, 0.05 wt. %, 0.04 wt. %, 0.03 wt. %, 0.02 wt. %, 0.01 wt. %, 0.009 wt. %, 0.008 wt. %, 0.007 wt. %, 0.006 wt. %, 0.005 wt. %, 0.004 wt. %, 0.003 wt. %, 0.002 wt. %, or 0.001 wt. %.

[00160] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of about between 1 wt. % to 50 wt. %, between 2 wt. % to 40 wt. %, between 3 wt. % to 30 wt. %, between 4 wt. % to 20 wt. %, between 5 wt. % to 15 wt. %, between 6 wt. % to 10 wt. %, between 7 wt. % to 9 wt. %, between 10 wt. % to 50 wt. %, between 15 wt. % to 45 wt. %, between 20 wt. % to 40 wt. %, between 25 wt. % to 35 wt. %, or between 30 wt. % to 35 wt. %.

[00161] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of about between 0.001 wt. % to 5 wt. %, between 5 wt. % to 10 wt. %, between 10 wt. % to 15 wt. %, between 15 wt. % to 20 wt. %, between 20 wt. % to 25 wt. %, between 25 wt. % to 30 wt. %, between 30 wt. % to 35 wt. %, between 35 wt. % to 40 wt. %, between 40 wt. % to 45 wt. %, or between 45 wt. % to 50 wt. %.

[00162] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of about between 0.001 wt. % to 1 wt. %, between 1 wt. % to 2 wt. %, between 2 wt. % to 3 wt. %, between 3 wt. % to 4 wt. %, between 4 wt. % to 5 wt. %, between 5 wt. % to 6 wt. %, between 6 wt. % to 7 wt. %, between 7 wt. % to 8 wt. %, between 8 wt. % to 9 wt. %, between 9 wt. % to 10 wt. %, between 10 wt. % to 11 wt. %, between 11 wt. % to 12 wt. %, between 12 wt. % to 13 wt. %, between 13 wt. % to 14 wt. %, between 14 wt. % to 15 wt. %, between 15 wt. % to 16 wt. %, between 16 wt. % to 17 wt. %, between 17 wt. % to 18 wt. %, between 18 wt. % to 19 wt. %, between 19 wt. % to 20 wt. %, between 20 wt. % to 21 wt. %, between 21 wt. % to 22 wt. %, between 22 wt. % to 23 wt. %, between 23 wt. % to 24 wt. %, between 24 wt. % to 25 wt. %, between 25 wt. % to 26 wt. %, between 26 wt. % to 27 wt. %, between 27 wt. % to 28 wt. %, between 28 wt. % to 29 wt. %, between 29 wt. % to 30 wt. %, between 30 wt. % to 31 wt. %, between 31 wt. % to 32 wt. %, between 32 wt. % to 33 wt. %, between 33 wt. % to 34 wt. %, between 34 wt. % to 35 wt. %, between 35 wt. % to 36 wt. %, between 36 wt. % to 37 wt. %, between 37 wt. % to 38 wt. %, between 38 wt. % to 39 wt. %, between 39 wt. % to 40 wt. %, between 40 wt. % to 41 wt. %, between 41 wt. % to 42 wt. %,

between 42 wt. % to 43 wt. %, between 43 wt. % to 44 wt. %, between 44 wt. % to 45 wt. %, between 45 wt. % to 46 wt. %, between 46 wt. % to 47 wt. %, between 47 wt. % to 48 wt. %, between 48 wt. % to 49 wt. %, or between 49 wt. % to 50 wt. %.

[00163] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of about less than 50 wt. %, less than 40 wt. %, less than 30 wt. %, less than 20 wt. %, less than 19.75 wt. %, less than 19.50 wt. %, less than 19.25 wt. %, less than 19 wt. %, less than 18.75 wt. %, less than 18.50 wt. %, less than 18.25 wt. %, less than 18 wt. %, less than 17.75 wt. %, less than 17.50 wt. %, less than 17.25 wt. %, less than 17 wt. %, less than 16.75 wt. %, less than 16.50 wt. %, less than 16.25 wt. % less than 16 wt. %, less than 15.75 wt. %, less than 15.50 wt. %, less than 15.25 wt. %, less than 15 wt. %, less than 14.75 wt. %, less than 14.50 wt. %, less than 14.25 wt. %, less than 14 wt. %, less than 13.75 wt. %, less than 13.50 wt. %, less than 13.25 wt. %, less than 13 wt. %, less than 12.75 wt. %, less than 12.50 wt. %, less than 12.25 wt. %, less than 12 wt. %, less than 11.75 wt. %, less than 11.50 wt. %, less than 11.25 wt. %, less than 11 wt. %, less than 10.75 wt. %, less than 10.50 wt. %, less than 10.25 wt. %, less than 10 wt. %, less than 9.75 wt. %, less than 9.50 wt. %, less than 9.25 wt. %, less than 9 wt. %, less than 8.75 wt. %, less than 8.50 wt. %, less than 8.25 wt. %, less than 8 wt. %, less than 7.75 wt. %, less than 7.50 wt. %, less than 7.25 wt. %, less than 7 wt. %, less than 6.75 wt. %, less than 6.50 wt. %, less than 6.25 wt. %, less than 6 wt. %, less than 5.75 wt. %, less than 5.50 wt. %, less than 5.25 wt. %, less than 5 wt. %, less than 4.75 wt. %, less than 4.50 wt. %, less than 4.25 wt. %, less than 4 wt. %, less than 3.75 wt. %, less than 3.50 wt. %, less than 3.25 wt. %, less than 3 wt. %, less than 2.75 wt. %, less than 2.50 wt. %, less than 2.25 wt. %, less than 2 wt. %, less than 1.75 wt. %, less than 1.50 wt. %, less than 1.25 wt. %, less than 1 wt. %, less than 0.5 wt. %, less than 0.4 wt. %, less than 0.3 wt. %, less than 0.2 wt. %, less than 0.1 wt. %, less than 0.09 wt. %, less than 0.08 wt. %, less than 0.07 wt. %, less than 0.06 wt. %, less than 0.05 wt. %, less than 0.04 wt. %, less than 0.03 wt. %, less than 0.02 wt. %, less than 0.01 wt. %, less than 0.009 wt. %, less than 0.008 wt. %, less than 0.007 wt. %, less than 0.006 wt. %, less than 0.005 wt. %, less than 0.004 wt. %, less than 0.003 wt. %, less than 0.002 wt. %, or less than 0.001 wt. %.

[00164] In some embodiments, the compositions of the invention may include one or more emollients that may be in an amount of about greater than 45 wt. %, greater than 40 wt. %, greater

than 30 wt. %, greater than 20 wt. %, greater than 19.75 wt. %, greater than 19.50 wt. %, greater than 19.25 wt. %, greater than 19 wt. %, greater than 18.75 wt. %, greater than 18.50 wt. %, greater than 18.25 wt. %, greater than 18 wt. %, greater than 17.75 wt. %, greater than 17.50 wt. %, greater than 17.25 wt. %, greater than 17 wt. %, greater than 16.75 wt. %, greater than 16.50 wt. %, greater than 16.25 wt. % greater than 16 wt. %, greater than 15.75 wt. %, greater than 15.50 wt. %, greater than 15.25 wt. %, greater than 15 wt. %, greater than 14.75 wt. %, greater than 14.50 wt. %, greater than 14.25 wt. %, greater than 14 wt. %, greater than 13.75 wt. %, greater than 13.50 wt. %, greater than 13.25 wt. %, greater than 13 wt. %, greater than 12.75 wt. %, greater than 12.50 wt. %, greater than 12.25 wt. %, greater than 12 wt. %, greater than 11.75 wt. %, greater than 11.50 wt. %, greater than 11.25 wt. %, greater than 11 wt. %, greater than 10.75 wt. %, greater than 10.50 wt. %, greater than 10.25 wt. %, greater than 10 wt. %, greater than 9.75 wt. %, greater than 9.50 wt. %, greater than 9.25 wt. %, greater than 9 wt. %, greater than 8.75 wt. %, greater than 8.50 wt. %, greater than 8.25 wt. %, greater than 8 wt. %, greater than 7.75 wt. %, greater than 7.50 wt. %, greater than 7.25 wt. %, greater than 7 wt. %, greater than 6.75 wt. %, greater than 6.50 wt. %, greater than 6.25 wt. %, greater than 6 wt. %, greater than 5.75 wt. %, greater than 5.50 wt. %, greater than 5.25 wt. %, greater than 5 wt. %, greater than 4.75 wt. %, greater than 4.50 wt. %, greater than 4.25 wt. %, greater than 4 wt. %, greater than 3.75 wt. %, greater than 3.50 wt. %, greater than 3.25 wt. %, greater than 3 wt. %, greater than 2.75 wt. %, greater than 2.50 wt. %, greater than 2.25 wt. %, greater than 2 wt. %, greater than 1.75 wt. %, greater than 1.50 wt. %, greater than 1.25 wt. %, greater than 1 wt. %, greater than 0.5 wt. %, greater than 0.4 wt. %, greater than 0.3 wt. %, greater than 0.2 wt. %, greater than 0.1 wt. %, greater than 0.09 wt. %, greater than 0.08 wt. %, greater than 0.07 wt. %, greater than 0.06 wt. %, greater than 0.05 wt. %, greater than 0.04 wt. %, greater than 0.03 wt. %, greater than 0.02 wt. %, greater than 0.01 wt. %, greater than 0.009 wt. %, greater than 0.008 wt. %, greater than 0.007 wt. %, greater than 0.006 wt. %, greater than 0.005 wt. %, greater than 0.004 wt. %, greater than 0.003 wt. %, greater than 0.002 wt. %, or greater than 0.001 wt. %.

[00165] In some embodiments, the compositions of the invention may include one or more preservatives. For example, the preservatives used in the invention may include Dermofeel PA-3 (water, ethanol, sodium phytate), sodium phytate, glyceryl caprylate, or caprylic/capric triglycerides.

[00166] In some embodiments, the compositions of the invention may include a scent. For example, the scent may be provided by one or more of the emollients or a synthetic scent or flavoring agent, including, without limitation, mint (e.g., peppermint essential oil and/or spearmint essential oil), orange (e.g., sweet orange essential oil and/or orange oil), or unscented (e.g., rosehip oil).

Moisturizer Compositions and Methods

[00167] In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 0.1% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 1% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 1.3% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 1.5% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 1.8% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 2% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 3% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 4% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is about 5% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 5% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 4% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 3% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 2% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 1.5% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 1% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 0.5% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is less than 0.1% (w/v). In an

embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is between about 0.1% (w/v) and about 5% (w/v). In an embodiment, the percent hyaluronic acid content in films of the present disclosure is between about 0.5% (w/v) and about 3% (w/v). In an embodiment, the percent hyaluronic acid content in moisturizing compositions of the present disclosure is between about 1% (w/v) and about 2% (w/v). Alternatively, in some embodiments, the compositions of the invention may exclude hyaluronic acid.

[00168] In some embodiments, a moisturizing composition of the present composition comprises an oil or butter, for example, jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, glycerin, or a combination of two or more thereof. In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is about 5% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is about 10% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is about 15% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is about 20% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is about 25% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is less than 25% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is less than 20% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is less than 15% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing

compositions of the present disclosure is less than 10% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is less than 5% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is less than 1% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is between 0% (v/v) and 25% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is between 0.1% (v/v) and 25% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is between 1% (v/v) and 20% (v/v). In an embodiment, the percent content of each oil or butter, (e.g., jojoba oil, rosehip oil, coconut oil, lemongrass oil, shea butter, or glycerin) in moisturizing compositions of the present disclosure is between 5% (v/v) and 15% (v/v).

[00169] In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is about 5% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is about 10% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is about 15% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is about 20% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is about 25% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is less than 25% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is less than 20% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is less than 15% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is less than 10% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is less than 5% (v/v). In an embodiment, the percent jojoba oil content in moisturizing

compositions of the present disclosure is less than 1% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is between 0% (v/v) and 25% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is between 0.1% (v/v) and 25% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is between 1% (v/v) and 20% (v/v). In an embodiment, the percent jojoba oil content in moisturizing compositions of the present disclosure is between 5% (v/v) and 15% (v/v).

[00170] In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is about 5% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is about 10% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is about 15% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is about 20% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is about 25% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is less than 25% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is less than 20% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is less than 15% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is less than 10% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is less than 5% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is less than 1% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is between 0% (v/v) and 25% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is between 0.1% (v/v) and 25% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is between 1% (v/v) and 20% (v/v). In an embodiment, the percent rosehip oil content in moisturizing compositions of the present disclosure is between 5% (v/v) and 15% (v/v).

[00171] In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is about 5% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is about 10% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is about 15% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is about 20% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is about 25% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is less than 25% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is less than 20% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is less than 15% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is less than 10% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is less than 5% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is less than 1% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is between 0% (v/v) and 25% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is between 0.1% (v/v) and 25% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is between 1% (v/v) and 20% (v/v). In an embodiment, the percent coconut oil content in moisturizing compositions of the present disclosure is between 5% (v/v) and 15% (v/v).

[00172] In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is about 5% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is about 10% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is about 15% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is about 20% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is about 25%

(v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is less than 25% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is less than 20% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is less than 15% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is less than 10% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is less than 5% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is less than 1% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is between 0% (v/v) and 25% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is between 0.1% (v/v) and 25% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is between 1% (v/v) and 20% (v/v). In an embodiment, the percent lemongrass oil content in moisturizing compositions of the present disclosure is between 5% (v/v) and 15% (v/v).

[00173] In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is about 5% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is about 10% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is about 15% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is about 20% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is about 25% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is less than 25% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is less than 20% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is less than 15% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is less than 10% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is less than 5% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is less than 1% (v/v). In an

embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is between 0% (v/v) and 25% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is between 0.1% (v/v) and 25% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is between 1% (v/v) and 20% (v/v). In an embodiment, the percent shea butter content in moisturizing compositions of the present disclosure is between 5% (v/v) and 15% (v/v).

[00174] In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is about 0.5% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is about 5% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is about 10% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is about 15% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is less than 15% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is less than 10% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is less than 5% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is less than 1% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is between 0% (v/v) and 15% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is between 0.1% (v/v) and 10% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is between 1% (v/v) and 10% (v/v). In an embodiment, the percent glycerin content in moisturizing compositions of the present disclosure is between 2% (v/v) and 8% (v/v).

[00175] In some embodiments, a moisturizing composition of the present composition comprises an additive, for example, vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, honeysuckle blend, or a combination of two or more thereof. In one embodiment, a moisturizing composition can be used to deliver hydrophobic compounds. In one embodiment, a moisturizing composition can be used to deliver hydrophilic compounds. In one embodiment, a

moisturizing composition can be used to deliver both hydrophobic and hydrophilic compounds together. Additives may be included to address pigment reduction, sun protection, fragrance, anti-aging and wrinkles, skin lightening, skin softening, skin moisturizing, scar reduction, exfoliation, skin toning, and/or skin firming. In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 0.1% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 0.5% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 1% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 1.5% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) of the present disclosure is about 2% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 2.5% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 3% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 3.5% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) of the present disclosure is about 4% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is about 4.5% (v/v) or (w/v). In an embodiment, the percent content of each additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) of the present disclosure is

about 5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 4.5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 4% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 3.5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 3% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 2.5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 2% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 1.5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 1% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is less than 0.5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is between 0% and 5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing

compositions of the present disclosure is between 0.1% and 5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is between 1% and 5% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is between 1% and 3% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is between 0.5% and 2% (v/v) or (w/v). In an embodiment, the percent content of an additive, (e.g., vitamin E, aspen bark, sodium anisate, oat flour, titanium dioxide, zinc oxide, or honeysuckle blend) in moisturizing compositions of the present disclosure is between 0.1% and 1% (v/v) or (w/v).

[00176] In some embodiments, a moisturizing composition of the present composition comprises an agent for adjusting pH, for example, HCl, NaOH, or a combination thereof. In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.05% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.1% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.15% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.2% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.3% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.4% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.5% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.6% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.7% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the

present disclosure is about 0.8% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 0.9% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 1% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 1.1% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 1.2% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 1.3% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 1.4% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is about 1.5% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 1.5% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl (e.g. 2M HCl) or NaOH (e.g. 5N NaOH)) in moisturizing compositions of the present disclosure is less than 1.4% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 1.3% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 1.2% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 1.1% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 1% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.9% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.8% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.7% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.6% (v/v). In an embodiment, the percent content of each pH

adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.5% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.4% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.3% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.2% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is less than 0.1% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is between 0.1% and 1.5% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is between 0.5% and 1.5% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is between 1% and 1.5% (v/v). In an embodiment, the percent content of each pH adjusting agent, (e.g., HCl or NaOH) in moisturizing compositions of the present disclosure is between 0.1% and 0.5% (v/v).

[00177] According to aspects illustrated herein, there is disclosed a method for preparing a moisturizing composition comprising pure silk fibroin-based protein fragments disclosed herein. Water (e.g. RO/DI) is poured into a beaker or KitchenAid bowl. Hyaluronic acid powder is added to the water. The solution is mixed vigorously at a power of 6-10 (KitchenAid) or 300-700 rpm (lab mixer) until the hyaluronic acid is fully dissolved (about 1-3 hours). A solution of pure silk fibroin based protein fragments is added to the hyaluronic acid solution and mixed gently at a power of 2 (KitchenAid) or 50-80 rpm (lab mixer) until silk and hyaluronic acid solution are homogenous. The silk/hyaluronic acid solution is stored in a refrigerator overnight. The solution may be transferred to another container. Jojoba oil, rosehip oil, vitamin E, and 5N NaOH are mixed. The hyaluronic acid/silk solution is mixed at a power of 4-10 (KitchenAid) or 300-700 rpm (lab mixer); the jojoba oil, rosehip oil, vitamin E, 5N NaOH mixture are added to the hyaluronic acid/silk solution. The solution is mixed until a white, lotion-like homogeneous mixture is formed. Continue to mix for at least 10 minutes. 2M HCl is added and the solution is mixed at a power of 4-10 (KitchenAid) 300-700 rpm (lab mixer) for at least 15 minutes. Aspen bark is added and the solution is mixed at a

power of 4-10 (KitchenAid) 300-700 rpm (lab mixer) for at least 15 minutes. Sodium anisate is added and the solution is mixed at a power of 4-10 (KitchenAid) 300-700 rpm (lab mixer) for at least 15 minutes to form the final moisturizer composition. In some embodiments, the foregoing method may be used for the preparation of a 1 liter batch moisturizer composition.

[00178] In some embodiments, a composition of the present disclosure can further include skin penetration enhancers, including, but not limited to, sulfoxides (such as dimethylsulfoxide), pyrrolidones (such as 2-pyrrolidone), alcohols (such as ethanol or decanal), azones (such as laurocapram and 1 -dodecylazacycloheptan-2-one), surfactants (including alkyl carboxylates and their corresponding acids such as oleic acid, fluoroalkylcarboxylates and their corresponding acids, alkyl sulfates, alky! ether sulfates, docusates such as dioctyl sodium sulfosuccinate, alkyl benzene sulfonates, alkyl ether phosphates, and alkyl aryl ether phosphates), glycols (such as propylene glycol), terpenes (such as limonene, p-cymene, geraniol, farnesol, eugenol, menthol, terpineol, carveol, carvone, fenchone, and verbenone), and dimethyl isosorbide.

[00179] In an embodiment, a solution of the present disclosure is contacted with a therapeutic agent and/or a molecule prior to forming the article. In an embodiment, molecules include, but are not limited to, antioxidants and enzymes. In an embodiment, molecules include, but are not limited to Selenium, Ubiquinone derivatives, Thiol-based antioxidants, Saccharide-containing antioxidants, Polyphenols, Botanical extracts, Caffeic acid, Apigenin, Pycnogenol, Resveratrol, Folic acid, Vitamin b12, Vitamin b6. Vitamin b3, Vitamin E, Vitamin C and derivatives thereof, Vitamin D, Vitamin A, Astaxathm, Lutein, Lycopene, Essential fatty acids (omegas 3 and 6), Iron, Zinc, magnesium, Flavonoids (soy, Cureumin, Silymarm, Pycnongeol), Growth factors, aloe, hyaluronic acid, extracellular matrix proteins, cells, nucleic acids, biomarkers, biological reagents, zinc oxide, benzoyl peroxide, retnoids, titanium, allergens in a known dose (for sensitization treatment), essential oils including, but not limited to, lemongrass or rosemary oil, and fragrances. Therapeutic agents include, but are not limited to, small molecules, drugs, proteins, peptides and nucleic acids. In an embodiment, a silk moisturizing composition of the present disclosure includes a molecule that is a vitamin, such as vitamin C, vitamin A and vitamin E. In an embodiment, a solution of the present disclosure is contacted with an allergen of known quantity prior to forming the article. Allergens include but are not limited to milk, eggs, peanuts, tree nuts, fish, shellfish, soy and wheat. Known

doses of allergen loaded within a silk article can be released at a known rate for controlled exposure allergy study, tests and sensitization treatment.

[00180] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of about 50 wt. %, about 45 wt. %, about 40 wt. %, about 35 wt. %, about 30 wt. %, about 25 wt. %, about 20 wt. %, about 19.75 wt. %, about 19.50 wt. %, about 19.25 wt. %, about 19 wt. %, about 18.75 wt. %, about 18.50 wt. %, about 18.25 wt. %, about 18 wt. %, about 17.75 wt. %, about 17.50 wt. %, about 17.25 wt. %, about 17 wt. %, about 16.75 wt. %, about 16.50 wt. %, about 16.25 wt. % about 16 wt. %, about 15.75 wt. %, about 15.50 wt. %, about 15.25 wt. %, about 15 wt. %, about 14.75 wt. %, about 14.50 wt. %, about 14.25 wt. %, about 14 wt. %, about 13.75 wt. %, about 13.50 wt. %, about 13.25 wt. %, about 13 wt. %, about 12.75 wt. %, about 12.50 wt. %, about 12.25 wt. %, about 12 wt. %, about 11.75 wt. %, about 11.50 wt. %, about 11.25 wt. %, about 11 wt. %, about 10.75 wt. %, about 10.50 wt. %, about 10.25 wt. %, about 10 wt. %, about 9.75 wt. %, about 9.50 wt. %, about 9.25 wt. %, about 9 wt. %, about 8.75 wt. %, about 8.50 wt. %, about 8.25 wt. %, about 8 wt. %, about 7.75 wt. %, about 7.50 wt. %, about 7.25 wt. %, about 7 wt. %, about 6.75 wt. %, about 6.50 wt. %, about 6.25 wt. %, about 6 wt. %, about 5.75 wt. %, about 5.50 wt. %, about 5.25 wt. %, about 5 wt. %, about 4.75 wt. %, about 4.50 wt. %, about 4.25 wt. %, about 4 wt. %, about 3.75 wt. %, about 3.50 wt. %, about 3.25 wt. %, about 3 wt. %, about 2.75 wt. %, about 2.50 wt. %, about 2.25 wt. %, about 2 wt. %, about 1.75 wt. %, about 1.50 wt. %, about 1.25 wt. %, about 1 wt. %, about 0.5 wt. %, about 0.4 wt. %, about 0.3 wt. %, about 0.2 wt. %, about 0.1 wt. %, about 0.09 wt. %, about 0.08 wt. %, about 0.07 wt. %, about 0.06 wt. %, about 0.05 wt. %, about 0.04 wt. %, about 0.03 wt. %, about 0.02 wt. %, about 0.01 wt. %, about 0.009 wt. %, about 0.008 wt. %, about 0.007 wt. %, about 0.006 wt. %, about 0.005 wt. %, about 0.004 wt. %, about 0.003 wt. %, about 0.002 wt. %, or about 0.001 wt. %.

[00181] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of between about 1 wt. % to about 50 wt. %, between about 2 wt. % to about 40 wt. %, between about 3 wt. % to about 30 wt. %, between about 4 wt. % to about 20 wt. %, between about 5 wt. % to about 15 wt. %, between about 6 wt. % to about 10 wt. %, between about 7 wt. % to about 9 wt. %, between about 10 wt. % to about 50 wt. %, between

about 15 wt. % to about 45 wt. %, between about 20 wt. % to about 40 wt. %, between about 25 wt. % to about 35 wt. %, or between about 25 wt. % to about 30 wt. %.

[00182] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of between about 0.001 wt. % to about 5 wt. %, between about 5 wt. % to about 10 wt. %, between about 10 wt. % to about 15 wt. %, between about 15 wt. % to about 20 wt. %, between about 20 wt. % to about 25 wt. %, between about 25 wt. % to about 30 wt. %, between about 30 wt. % to about 35 wt. %, between about 35 wt. % to about 40 wt. %, between about 40 wt. % to about 45 wt. %, or between about 45 wt. % to about 50 wt. %.

[00183] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of between about 0.001 wt. % to about 1 wt. %, between about 1 wt. % to about 2 wt. %, between about 2 wt. % to about 3 wt. %, between about 3 wt. % to about 4 wt. %, between about 4 wt. % to about 5 wt. %, between about 5 wt. % to about 6 wt. %, between about 6 wt. % to about 7 wt. %, between about 7 wt. % to about 8 wt. %, between about 8 wt. % to about 9 wt. %, between about 9 wt. % to about 10 wt. %, between about 10 wt. % to about 11 wt. %, between about 11 wt. % to about 12 wt. %, between about 12 wt. % to about 13 wt. %, between about 13 wt. % to about 14 wt. %, between about 14 wt. % to about 15 wt. %, between about 15 wt. % to about 16 wt. %, between about 16 wt. % to about 17 wt. %, between about 17 wt. % to about 18 wt. %, between about 18 wt. % to about 19 wt. %, between about 19 wt. % to about 20 wt. %, between about 20 wt. % to about 21 wt. %, between about 21 wt. % to about 22 wt. %, between about 22 wt. % to about 23 wt. %, between about 23 wt. % to about 24 wt. %, between about 24 wt. % to about 25 wt. %, between about 25 wt. % to about 26 wt. %, between about 26 wt. % to about 27 wt. %, between about 27 wt. % to about 28 wt. %, between about 28 wt. % to about 29 wt. %, between about 29 wt. % to about 30 wt. %, between about 30 wt. % to about 31 wt. %, between about 31 wt. % to about 32 wt. %, between about 32 wt. % to about 33 wt. %, between about 33 wt. % to about 34 wt. %, between about 34 wt. % to about 35 wt. %, between about 35 wt. % to about 36 wt. %, between about 36 wt. % to about 37 wt. %, between about 37 wt. % to about 38 wt. %, between about 38 wt. % to about 39 wt. %, between about 39 wt. % to about 40 wt. %, between about 40 wt. % to about 41 wt. %, between about 41 wt. % to about 42 wt. %, between about 42 wt. % to about 43 wt. %, between about 43 wt. % to about 44 wt. %, between

about 44 wt. % to about 45 wt. %, between about 45 wt. % to about 46 wt. %, between about 46 wt. % to about 47 wt. %, between about 47 wt. % to about 48 wt. %, between about 48 wt. % to about 49 wt. %, or between about 49 wt. % to about 50 wt. %.

[00184] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of 50 wt. %, 45 wt. %, 40 wt. %, 35 wt. %, 30 wt. %, 25 wt. %, 20 wt. %, 19.75 wt. %, 19.50 wt. %, 19.25 wt. %, 19 wt. %, 18.75 wt. %, 18.50 wt. %, 18.25 wt. %, 18 wt. %, 17.75 wt. %, 17.50 wt. %, 17.25 wt. %, 17 wt. %, 16.75 wt. %, 16.50 wt. %, 16.25 wt. % 16 wt. %, 15.75 wt. %, 15.50 wt. %, 15.25 wt. %, 15 wt. %, 14.75 wt. %, 14.50 wt. %, 14.25 wt. %, 14 wt. %, 13.75 wt. %, 13.50 wt. %, 13.25 wt. %, 13 wt. %, 12.75 wt. %, 12.50 wt. %, 12.25 wt. %, 12 wt. %, 11.75 wt. %, 11.50 wt. %, 11.25 wt. %, 11 wt. %, 10.75 wt. %, 10.50 wt. %, 10.25 wt. %, 10 wt. %, 9.75 wt. %, 9.50 wt. %, 9.25 wt. %, 9 wt. %, 8.75 wt. %, 8.50 wt. %, 8.25 wt. %, 8 wt. %, 7.75 wt. %, 7.50 wt. %, 7.25 wt. %, 7 wt. %, 6.75 wt. %, 6.50 wt. %, 6.25 wt. %, 6 wt. %, 5.75 wt. %, 5.50 wt. %, 5.25 wt. %, 5 wt. %, 4.75 wt. %, 4.50 wt. %, 4.25 wt. %, 4 wt. %, 3.75 wt. %, 3.50 wt. %, 3.25 wt. %, 3 wt. %, 2.75 wt. %, 2.50 wt. %, 2.25 wt. %, 2 wt. %, 1.75 wt. %, 1.50 wt. %, 1.25 wt. %, 1 wt. %, 0.5 wt. %, 0.4 wt. %, 0.3 wt. %, 0.2 wt. %, 0.1 wt. %, 0.09 wt. %, 0.08 wt. %, 0.07 wt. %, 0.06 wt. %, 0.05 wt. %, 0.04 wt. %, 0.03 wt. %, 0.02 wt. %, 0.01 wt. %, 0.009 wt. %, 0.008 wt. %, 0.007 wt. %, 0.006 wt. %, 0.005 wt. %, 0.004 wt. %, 0.003 wt. %, 0.002 wt. %, or 0.001 wt. %.

[00185] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of between 1 wt. % to 50 wt. %, between 2 wt. % to 40 wt. %, between 3 wt. % to 30 wt. %, between 4 wt. % to 20 wt. %, between 5 wt. % to 15 wt. %, between 6 wt. % to 10 wt. %, between 7 wt. % to 9 wt. %, between 10 wt. % to 50 wt. %, between 15 wt. % to 45 wt. %, between 20 wt. % to 40 wt. %, between 25 wt. % to 35 wt. %, or between 30 wt. % to 35 wt. %.

[00186] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of between 0.001 wt. % to 5 wt. %, between 5 wt. % to 10 wt. %, between 10 wt. % to 15 wt. %, between 15 wt. % to 20 wt. %, between 20 wt. % to 25 wt. %, between 25 wt. % to 30 wt. %, between 30 wt. % to 35 wt. %, between 35 wt. % to 40 wt. %, between 40 wt. % to 45 wt. %, or between 45 wt. % to 50 wt. %.

[00187] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of between 0.001 wt. % to 1 wt. %, between 1 wt. % to 2 wt. %, between 2 wt. % to 3 wt. %, between 3 wt. % to 4 wt. %, between 4 wt. % to 5 wt. %, between 5 wt. % to 6 wt. %, between 6 wt. % to 7 wt. %, between 7 wt. % to 8 wt. %, between 8 wt. % to 9 wt. %, between 9 wt. % to 10 wt. %, between 10 wt. % to 11 wt. %, between 11 wt. % to 12 wt. %, between 12 wt. % to 13 wt. %, between 13 wt. % to 14 wt. %, between 14 wt. % to 15 wt. %, between 15 wt. % to 16 wt. %, between 16 wt. % to 17 wt. %, between 17 wt. % to 18 wt. %, between 18 wt. % to 19 wt. %, between 19 wt. % to 20 wt. %, between 20 wt. % to 21 wt. %, between 21 wt. % to 22 wt. %, between 22 wt. % to 23 wt. %, between 23 wt. % to 24 wt. %, between 24 wt. % to 25 wt. %, between 25 wt. % to 26 wt. %, between 26 wt. % to 27 wt. %, between 27 wt. % to 28 wt. %, between 28 wt. % to 29 wt. %, between 29 wt. % to 30 wt. %, between 30 wt. % to 31 wt. %, between 31 wt. % to 32 wt. %, between 32 wt. % to 33 wt. %, between 33 wt. % to 34 wt. %, between 34 wt. % to 35 wt. %, between 35 wt. % to 36 wt. %, between 36 wt. % to 37 wt. %, between 37 wt. % to 38 wt. %, between 38 wt. % to 39 wt. %, between 39 wt. % to 40 wt. %, between 40 wt. % to 41 wt. %, between 41 wt. % to 42 wt. %, between 42 wt. % to 43 wt. %, between 43 wt. % to 44 wt. %, between 44 wt. % to 45 wt. %, between 45 wt. % to 46 wt. %, between 46 wt. % to 47 wt. %, between 47 wt. % to 48 wt. %, between 48 wt. % to 49 wt. %, or between 49 wt. % to 50 wt. %.

[00188] In an embodiment, a moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of less than 50 wt. %, less than 40 wt. %, less than 30 wt. %, less than 20 wt. %, less than 19.75 wt. %, less than 19.50 wt. %, less than 19.25 wt. %, less than 19 wt. %, less than 18.75 wt. %, less than 18.50 wt. %, less than 18.25 wt. %, less than 18 wt. %, less than 17.75 wt. %, less than 17.50 wt. %, less than 17.25 wt. %, less than 17 wt. %, less than 16.75 wt. %, less than 16.50 wt. %, less than 16.25 wt. % less than 16 wt. %, less than 15.75 wt. %, less than 15.50 wt. %, less than 15.25 wt. %, less than 15 wt. %, less than 14.75 wt. %, less than 14.50 wt. %, less than 14.25 wt. %, less than 14 wt. %, less than 13.75 wt. %, less than 13.50 wt. %, less than 13.25 wt. %, less than 13 wt. %, less than 12.75 wt. %, less than 12.50 wt. %, less than 12.25 wt. %, less than 12 wt. %, less than 11.75 wt. %, less than 11.50 wt. %, less than 11.25 wt. %, less than 11 wt. %, less than 10.75 wt. %, less than 10.50 wt. %, less than 10.25 wt. %, less than 10 wt. %, less than 9.75 wt. %, less than 9.50 wt. %, less than 9.25 wt. %, less than 9 wt. %, less than

8.75 wt. %, less than 8.50 wt. %, less than 8.25 wt. %, less than 8 wt. %, less than 7.75 wt. %, less than 7.50 wt. %, less than 7.25 wt. %, less than 7 wt. %, less than 6.75 wt. %, less than 6.50 wt. %, less than 6.25 wt. %, less than 6 wt. %, less than 5.75 wt. %, less than 5.50 wt. %, less than 5.25 wt. %, less than 5 wt. %, less than 4.75 wt. %, less than 4.50 wt. %, less than 4.25 wt. %, less than 4 wt. %, less than 3.75 wt. %, less than 3.50 wt. %, less than 3.25 wt. %, less than 3 wt. %, less than 2.75 wt. %, less than 2.50 wt. %, less than 2.25 wt. %, less than 2 wt. %, less than 1.75 wt. %, less than 1.50 wt. %, less than 1.25 wt. %, less than 1 wt. %, less than 0.5 wt. %, less than 0.4 wt. %, less than 0.3 wt. %, less than 0.2 wt. %, less than 0.1 wt. %, less than 0.09 wt. %, less than 0.08 wt. %, less than 0.07 wt. %, less than 0.06 wt. %, less than 0.05 wt. %, less than 0.04 wt. %, less than 0.03 wt. %, less than 0.02 wt. %, less than 0.01 wt. %, less than 0.009 wt. %, less than 0.008 wt. %, less than 0.007 wt. %, less than 0.006 wt. %, less than 0.005 wt. %, less than 0.004 wt. %, less than 0.003 wt. %, less than 0.002 wt. %, or less than 0.001 wt. %.

[00189] In an embodiment, the moisturizer composition further includes an amount of vitamin C, Vitamin B, Vitamin A, or a derivative thereof, of greater than 45 wt. %, greater than 40 wt. %, greater than 30 wt. %, greater than 20 wt. %, greater than 19.75 wt. %, greater than 19.50 wt. %, greater than 19.25 wt. %, greater than 19 wt. %, greater than 18.75 wt. %, greater than 18.50 wt. %, greater than 18.25 wt. %, greater than 18 wt. %, greater than 17.75 wt. %, greater than 17.50 wt. %, greater than 17.25 wt. %, greater than 17 wt. %, greater than 16.75 wt. %, greater than 16.50 wt. %, greater than 16.25 wt. % greater than 16 wt. %, greater than 15.75 wt. %, greater than 15.50 wt. %, greater than 15.25 wt. %, greater than 15 wt. %, greater than 14.75 wt. %, greater than 14.50 wt. %, greater than 14.25 wt. %, greater than 14 wt. %, greater than 13.75 wt. %, greater than 13.50 wt. %, greater than 13.25 wt. %, greater than 13 wt. %, greater than 12.75 wt. %, greater than 12.50 wt. %, greater than 12.25 wt. %, greater than 12 wt. %, greater than 11.75 wt. %, greater than 11.50 wt. %, greater than 11.25 wt. %, greater than 11 wt. %, greater than 10.75 wt. %, greater than 10.50 wt. %, greater than 10.25 wt. %, greater than 10 wt. %, greater than 9.75 wt. %, greater than 9.50 wt. %, greater than 9.25 wt. %, greater than 9 wt. %, greater than 8.75 wt. %, greater than 8.50 wt. %, greater than 8.25 wt. %, greater than 8 wt. %, greater than 7.75 wt. %, greater than 7.50 wt. %, greater than 7.25 wt. %, greater than 7 wt. %, greater than 6.75 wt. %, greater than 6.50 wt. %, greater than 6.25 wt. %, greater than 6 wt. %, greater than 5.75 wt. %, greater than 5.50 wt. %, greater than 5.25 wt. %, greater than 5 wt. %, greater than 4.75 wt. %, greater than 4.50 wt. %,

greater than 4.25 wt. %, greater than 4 wt. %, greater than 3.75 wt. %, greater than 3.50 wt. %, greater than 3.25 wt. %, greater than 3 wt. %, greater than 2.75 wt. %, greater than 2.50 wt. %, greater than 2.25 wt. %, greater than 2 wt. %, greater than 1.75 wt. %, greater than 1.50 wt. %, greater than 1.25 wt. %, greater than 1 wt. %, greater than 0.5 wt. %, greater than 0.4 wt. %, greater than 0.3 wt. %, greater than 0.2 wt. %, greater than 0.1 wt. %, greater than 0.09 wt. %, greater than 0.08 wt. %, greater than 0.07 wt. %, greater than 0.06 wt. %, greater than 0.05 wt. %, greater than 0.04 wt. %, greater than 0.03 wt. %, greater than 0.02 wt. %, greater than 0.01 wt. %, greater than 0.009 wt. %, greater than 0.008 wt. %, greater than 0.007 wt. %, greater than 0.006 wt. %, greater than 0.005 wt. %, greater than 0.004 wt. %, greater than 0.003 wt. %, greater than 0.002 wt. %, or greater than 0.001 wt. %.

[00190] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of about 50 wt. %, about 45 wt. %, about 40 wt. %, about 35 wt. %, about 30 wt. %, about 25 wt. %, about 20 wt. %, about 19.75 wt. %, about 19.50 wt. %, about 19.25 wt. %, about 19 wt. %, about 18.75 wt. %, about 18.50 wt. %, about 18.25 wt. %, about 18 wt. %, about 17.75 wt. %, about 17.50 wt. %, about 17.25 wt. %, about 17 wt. %, about 16.75 wt. %, about 16.50 wt. %, about 16.25 wt. % about 16 wt. %, about 15.75 wt. %, about 15.50 wt. %, about 15.25 wt. %, about 15 wt. %, about 14.75 wt. %, about 14.50 wt. %, about 14.25 wt. %, about 14 wt. %, about 13.75 wt. %, about 13.50 wt. %, about 13.25 wt. %, about 13 wt. %, about 12.75 wt. %, about 12.50 wt. %, about 12.25 wt. %, about 12 wt. %, about 11.75 wt. %, about 11.50 wt. %, about 11.25 wt. %, about 11 wt. %, about 10.75 wt. %, about 10.50 wt. %, about 10.25 wt. %, about 10 wt. %, about 9.75 wt. %, about 9.50 wt. %, about 9.25 wt. %, about 9 wt. %, about 8.75 wt. %, about 8.50 wt. %, about 8.25 wt. %, about 8 wt. %, about 7.75 wt. %, about 7.50 wt. %, about 7.25 wt. %, about 7 wt. %, about 6.75 wt. %, about 6.50 wt. %, about 6.25 wt. %, about 6 wt. %, about 5.75 wt. %, about 5.50 wt. %, about 5.25 wt. %, about 5 wt. %, about 4.75 wt. %, about 4.50 wt. %, about 4.25 wt. %, about 4 wt. %, about 3.75 wt. %, about 3.50 wt. %, about 3.25 wt. %, about 3 wt. %, about 2.75 wt. %, about 2.50 wt. %, about 2.25 wt. %, about 2 wt. %, about 1.75 wt. %, about 1.50 wt. %, about 1.25 wt. %, about 1 wt. %, about 0.5 wt. %, about 0.4 wt. %, about 0.3 wt. %, about 0.2 wt. %, about 0.1 wt. %, about 0.09 wt. %, about 0.08 wt. %, about 0.07 wt. %, about 0.06 wt. %, about 0.05 wt. %, about 0.04 wt. %, about 0.03 wt. %, about 0.02 wt. %, about 0.01 wt. %, about 0.009 wt. %,

about 0.008 wt. %, about 0.007 wt. %, about 0.006 wt. %, about 0.005 wt. %, about 0.004 wt. %, about 0.003 wt. %, about 0.002 wt. %, or about 0.001 wt. %.

[00191] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of between about 1 wt. % to about 50 wt. %, between about 2 wt. % to about 40 wt. %, between about 3 wt. % to about 30 wt. %, between about 4 wt. % to about 20 wt. %, between about 5 wt. % to about 15 wt. %, between about 6 wt. % to about 10 wt. %, between about 7 wt. % to about 9 wt. %, between about 10 wt. % to about 50 wt. %, between about 15 wt. % to about 45 wt. %, between about 20 wt. % to about 40 wt. %, between about 25 wt. % to about 35 wt. %, or between about 25 wt. % to about 30 wt. %.

[00192] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of between about 0.001 wt. % to about 5 wt. %, between about 5 wt. % to about 10 wt. %, between about 10 wt. % to about 15 wt. %, between about 15 wt. % to about 20 wt. %, between about 20 wt. % to about 25 wt. %, between about 25 wt. % to about 30 wt. %, between about 30 wt. % to about 35 wt. %, between about 35 wt. % to about 40 wt. %, between about 40 wt. % to about 45 wt. %, or between about 45 wt. % to about 50 wt. %.

[00193] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of between about 0.001 wt. % to about 1 wt. %, between about 1 wt. % to about 2 wt. %, between about 2 wt. % to about 3 wt. %, between about 3 wt. % to about 4 wt. %, between about 4 wt. % to about 5 wt. %, between about 5 wt. % to about 6 wt. %, between about 6 wt. % to about 7 wt. %, between about 7 wt. % to about 8 wt. %, between about 8 wt. % to about 9 wt. %, between about 9 wt. % to about 10 wt. %, between about 10 wt. % to about 11 wt. %, between about 11 wt. % to about 12 wt. %, between about 12 wt. % to about 13 wt. %, between about 13 wt. % to about 14 wt. %, between about 14 wt. % to about 15 wt. %, between about 15 wt. % to about 16 wt. %, between about 16 wt. % to about 17 wt. %, between about 17 wt. % to about 18 wt. %, between about 18 wt. % to about 19 wt. %, between about 19 wt. % to about 20 wt. %, between about 20 wt. % to about 21 wt. %, between about 21 wt. % to about 22 wt. %, between about 22 wt. % to about 23 wt. %, between about 23 wt. % to about 24 wt. %, between about 24 wt. % to about 25 wt. %, between about 25 wt. % to about 26 wt. %, between about 26 wt. % to about 27 wt. %, between about 27 wt. % to about 28 wt. %, between about 28 wt. % to about 29 wt. %, between about 29 wt.

% to about 30 wt. %, between about 30 wt. % to about 31 wt. %, between about 31 wt. % to about 32 wt. %, between about 32 wt. % to about 33 wt. %, between about 33 wt. % to about 34 wt. %, between about 34 wt. % to about 35 wt. %, between about 35 wt. % to about 36 wt. %, between about 36 wt. % to about 37 wt. %, between about 37 wt. % to about 38 wt. %, between about 38 wt. % to about 39 wt. %, between about 39 wt. % to about 40 wt. %, between about 40 wt. % to about 41 wt. %, between about 41 wt. % to about 42 wt. %, between about 42 wt. % to about 43 wt. %, between about 43 wt. % to about 44 wt. %, between about 44 wt. % to about 45 wt. %, between about 45 wt. % to about 46 wt. %, between about 46 wt. % to about 47 wt. %, between about 47 wt. % to about 48 wt. %, between about 48 wt. % to about 49 wt. %, or between about 49 wt. % to about 50 wt. %.

[00194] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of 50 wt. %, 45 wt. %, 40 wt. %, 35 wt. %, 30 wt. %, 25 wt. %, 20 wt. %, 19.75 wt. %, 19.50 wt. %, 19.25 wt. %, 19 wt. %, 18.75 wt. %, 18.50 wt. %, 18.25 wt. %, 18 wt. %, 17.75 wt. %, 17.50 wt. %, 17.25 wt. %, 17 wt. %, 16.75 wt. %, 16.50 wt. %, 16.25 wt. % 16 wt. %, 15.75 wt. %, 15.50 wt. %, 15.25 wt. %, 15 wt. %, 14.75 wt. %, 14.50 wt. %, 14.25 wt. %, 14 wt. %, 13.75 wt. %, 13.50 wt. %, 13.25 wt. %, 13 wt. %, 12.75 wt. %, 12.50 wt. %, 12.25 wt. %, 12 wt. %, 11.75 wt. %, 11.50 wt. %, 11.25 wt. %, 11 wt. %, 10.75 wt. %, 10.50 wt. %, 10.25 wt. %, 10 wt. %, 9.75 wt. %, 9.50 wt. %, 9.25 wt. %, 9 wt. %, 8.75 wt. %, 8.50 wt. %, 8.25 wt. %, 8 wt. %, 7.75 wt. %, 7.50 wt. %, 7.25 wt. %, 7 wt. %, 6.75 wt. %, 6.50 wt. %, 6.25 wt. %, 6 wt. %, 5.75 wt. %, 5.50 wt. %, 5.25 wt. %, 5 wt. %, 4.75 wt. %, 4.50 wt. %, 4.25 wt. %, 4 wt. %, 3.75 wt. %, 3.50 wt. %, 3.25 wt. %, 3 wt. %, 2.75 wt. %, 2.50 wt. %, 2.25 wt. %, 2 wt. %, 1.75 wt. %, 1.50 wt. %, 1.25 wt. %, 1 wt. %, 0.5 wt. %, 0.4 wt. %, 0.3 wt. %, 0.2 wt. %, 0.1 wt. %, 0.09 wt. %, 0.08 wt. %, 0.07 wt. %, 0.06 wt. %, 0.05 wt. %, 0.04 wt. %, 0.03 wt. %, 0.02 wt. %, 0.01 wt. %, 0.009 wt. %, 0.008 wt. %, 0.007 wt. %, 0.006 wt. %, 0.005 wt. %, 0.004 wt. %, 0.003 wt. %, 0.002 wt. %, or 0.001 wt. %.

[00195] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of between 1 wt. % to 50 wt. %, between 2 wt. % to 40 wt. %, between 3 wt. % to 30 wt. %, between 4 wt. % to 20 wt. %, between 5 wt. % to 15 wt. %, between 6 wt. % to 10 wt. %, between 7 wt. % to 9 wt. %, between 10 wt. % to 50 wt. %, between 15 wt. % to 45 wt. %, between 20 wt. % to 40 wt. %, between 25 wt. % to 35 wt. %, or between 30 wt. % to 35 wt. %.

[00196] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of between 0.001 wt. % to 5 wt. %, between 5 wt. % to 10 wt. %, between 10 wt. % to 15 wt. %, between 15 wt. % to 20 wt. %, between 20 wt. % to 25 wt. %, between 25 wt. % to 30 wt. %, between 30 wt. % to 35 wt. %, between 35 wt. % to 40 wt. %, between 40 wt. % to 45 wt. %, or between 45 wt. % to 50 wt. %.

[00197] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of between 0.001 wt. % to 1 wt. %, between 1 wt. % to 2 wt. %, between 2 wt. % to 3 wt. %, between 3 wt. % to 4 wt. %, between 4 wt. % to 5 wt. %, between 5 wt. % to 6 wt. %, between 6 wt. % to 7 wt. %, between 7 wt. % to 8 wt. %, between 8 wt. % to 9 wt. %, between 9 wt. % to 10 wt. %, between 10 wt. % to 11 wt. %, between 11 wt. % to 12 wt. %, between 12 wt. % to 13 wt. %, between 13 wt. % to 14 wt. %, between 14 wt. % to 15 wt. %, between 15 wt. % to 16 wt. %, between 16 wt. % to 17 wt. %, between 17 wt. % to 18 wt. %, between 18 wt. % to 19 wt. %, between 19 wt. % to 20 wt. %, between 20 wt. % to 21 wt. %, between 21 wt. % to 22 wt. %, between 22 wt. % to 23 wt. %, between 23 wt. % to 24 wt. %, between 24 wt. % to 25 wt. %, between 25 wt. % to 26 wt. %, between 26 wt. % to 27 wt. %, between 27 wt. % to 28 wt. %, between 28 wt. % to 29 wt. %, between 29 wt. % to 30 wt. %, between 30 wt. % to 31 wt. %, between 31 wt. % to 32 wt. %, between 32 wt. % to 33 wt. %, between 33 wt. % to 34 wt. %, between 34 wt. % to 35 wt. %, between 35 wt. % to 36 wt. %, between 36 wt. % to 37 wt. %, between 37 wt. % to 38 wt. %, between 38 wt. % to 39 wt. %, between 39 wt. % to 40 wt. %, between 40 wt. % to 41 wt. %, between 41 wt. % to 42 wt. %, between 42 wt. % to 43 wt. %, between 43 wt. % to 44 wt. %, between 44 wt. % to 45 wt. %, between 45 wt. % to 46 wt. %, between 46 wt. % to 47 wt. %, between 47 wt. % to 48 wt. %, between 48 wt. % to 49 wt. %, or between 49 wt. % to 50 wt. %.

[00198] In an embodiment, a moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of less than 50 wt. %, less than 40 wt. %, less than 30 wt. %, less than 20 wt. %, less than 19.75 wt. %, less than 19.50 wt. %, less than 19.25 wt. %, less than 19 wt. %, less than 18.75 wt. %, less than 18.50 wt. %, less than 18.25 wt. %, less than 18 wt. %, less than 17.75 wt. %, less than 17.50 wt. %, less than 17.25 wt. %, less than 17 wt. %, less than 16.75 wt. %, less than 16.50 wt. %, less than 16.25 wt. % less than 16 wt. %, less than 15.75 wt. %, less than 15.50 wt. %,

less than 15.25 wt. %, less than 15 wt. %, less than 14.75 wt. %, less than 14.50 wt. %, less than 14.25 wt. %, less than 14 wt. %, less than 13.75 wt. %, less than 13.50 wt. %, less than 13.25 wt. %, less than 13 wt. %, less than 12.75 wt. %, less than 12.50 wt. %, less than 12.25 wt. %, less than 12 wt. %, less than 11.75 wt. %, less than 11.50 wt. %, less than 11.25 wt. %, less than 11 wt. %, less than 10.75 wt. %, less than 10.50 wt. %, less than 10.25 wt. %, less than 10 wt. %, less than 9.75 wt. %, less than 9.50 wt. %, less than 9.25 wt. %, less than 9 wt. %, less than 8.75 wt. %, less than 8.50 wt. %, less than 8.25 wt. %, less than 8 wt. %, less than 7.75 wt. %, less than 7.50 wt. %, less than 7.25 wt. %, less than 7 wt. %, less than 6.75 wt. %, less than 6.50 wt. %, less than 6.25 wt. %, less than 6 wt. %, less than 5.75 wt. %, less than 5.50 wt. %, less than 5.25 wt. %, less than 5 wt. %, less than 4.75 wt. %, less than 4.50 wt. %, less than 4.25 wt. %, less than 4 wt. %, less than 3.75 wt. %, less than 3.50 wt. %, less than 3.25 wt. %, less than 3 wt. %, less than 2.75 wt. %, less than 2.50 wt. %, less than 2.25 wt. %, less than 2 wt. %, less than 1.75 wt. %, less than 1.50 wt. %, less than 1.25 wt. %, less than 1 wt. %, less than 0.5 wt. %, less than 0.4 wt. %, less than 0.3 wt. %, less than 0.2 wt. %, less than 0.1 wt. %, less than 0.09 wt. %, less than 0.08 wt. %, less than 0.07 wt. %, less than 0.06 wt. %, less than 0.05 wt. %, less than 0.04 wt. %, less than 0.03 wt. %, less than 0.02 wt. %, less than 0.01 wt. %, less than 0.009 wt. %, less than 0.008 wt. %, less than 0.007 wt. %, less than 0.006 wt. %, less than 0.005 wt. %, less than 0.004 wt. %, less than 0.003 wt. %, less than 0.002 wt. %, or less than 0.001 wt. %.

[00199] In an embodiment, the moisturizer composition further includes an amount of vitamin E, or a derivative thereof, of greater than 45 wt. %, greater than 40 wt. %, greater than 30 wt. %, greater than 20 wt. %, greater than 19.75 wt. %, greater than 19.50 wt. %, greater than 19.25 wt. %, greater than 19 wt. %, greater than 18.75 wt. %, greater than 18.50 wt. %, greater than 18.25 wt. %, greater than 18 wt. %, greater than 17.75 wt. %, greater than 17.50 wt. %, greater than 17.25 wt. %, greater than 17 wt. %, greater than 16.75 wt. %, greater than 16.50 wt. %, greater than 16.25 wt. % greater than 16 wt. %, greater than 15.75 wt. %, greater than 15.50 wt. %, greater than 15.25 wt. %, greater than 15 wt. %, greater than 14.75 wt. %, greater than 14.50 wt. %, greater than 14.25 wt. %, greater than 14 wt. %, greater than 13.75 wt. %, greater than 13.50 wt. %, greater than 13.25 wt. %, greater than 13 wt. %, greater than 12.75 wt. %, greater than 12.50 wt. %, greater than 12.25 wt. %, greater than 12 wt. %, greater than 11.75 wt. %, greater than 11.50 wt. %, greater than 11.25 wt. %, greater than 11 wt. %, greater than 10.75 wt. %, greater than 10.50 wt. %, greater than 10.25 wt. %,

greater than 10 wt. %, greater than 9.75 wt. %, greater than 9.50 wt. %, greater than 9.25 wt. %, greater than 9 wt. %, greater than 8.75 wt. %, greater than 8.50 wt. %, greater than 8.25 wt. %, greater than 8 wt. %, greater than 7.75 wt. %, greater than 7.50 wt. %, greater than 7.25 wt. %, greater than 7 wt. %, greater than 6.75 wt. %, greater than 6.50 wt. %, greater than 6.25 wt. %, greater than 6 wt. %, greater than 5.75 wt. %, greater than 5.50 wt. %, greater than 5.25 wt. %, greater than 5 wt. %, greater than 4.75 wt. %, greater than 4.50 wt. %, greater than 4.25 wt. %, greater than 4 wt. %, greater than 3.75 wt. %, greater than 3.50 wt. %, greater than 3.25 wt. %, greater than 3 wt. %, greater than 2.75 wt. %, greater than 2.50 wt. %, greater than 2.25 wt. %, greater than 2 wt. %, greater than 1.75 wt. %, greater than 1.50 wt. %, greater than 1.25 wt. %, greater than 1 wt. %, greater than 0.5 wt. %, greater than 0.4 wt. %, greater than 0.3 wt. %, greater than 0.2 wt. %, greater than 0.1 wt. %, greater than 0.09 wt. %, greater than 0.08 wt. %, greater than 0.07 wt. %, greater than 0.06 wt. %, greater than 0.05 wt. %, greater than 0.04 wt. %, greater than 0.03 wt. %, greater than 0.02 wt. %, greater than 0.01 wt. %, greater than 0.009 wt. %, greater than 0.008 wt. %, greater than 0.007 wt. %, greater than 0.006 wt. %, greater than 0.005 wt. %, greater than 0.004 wt. %, greater than 0.003 wt. %, greater than 0.002 wt. %, or greater than 0.001 wt. %.

[00200] In an embodiment, the invention includes compositions that are stable water-in-oil (w/o) emulsions comprising water, oil, and silk protein fragment solutions. In an embodiment, the invention includes compositions that are stable oil-in-water (o/w) emulsions comprising water, oil, and silk protein fragment solutions. In an embodiment, the invention includes compositions that are stable emulsions. The term "stable emulsion" refers to an emulsion that does not undergo phase separation upon storage. In an embodiment, a stable solution does not undergo phase separation for at least 1 day, at least 2 days, at least 4 days, at least 1 week, at least 2 weeks, at least 1 month, at least 2 months, at least 6 months, and at least 1 year.

[00201] In an embodiment, the invention includes compositions that are in the form of a liquid, semisolid, or solid. In some embodiments, the invention includes compositions that are in the form of lotions, creams, oils, gels, emulsions, sticks, sprays, ointments, pastes, mousses, foams, or suspensions. In an embodiment, the invention includes compositions that are in the form of a sunscreen, a cleanser, a bar of soap, a lip balm, a foot balm, a deodorant stick, an antiperspirant stick, a liquid or spray deodorant, a liquid or spray antiperspirant, a hair conditioner, and a shampoo. Nevertheless, it is understood to be within the scope of the invention that any of the foregoing

compositions may be prepared with elements of other compositions of the invention such as, without limitation, silk, hyaluronic acid, and one or more emollients as described herein.

[00202] In an embodiment, the invention includes compositions that may be shampoos. For example, the shampoos of the invention may include a detergent, soap, and/or a surfactant, including, without limitation, fatty acids (e.g., one or more of lauric acid, myristic acid, stearic acid, and oleic acid) and/or a lauryl/laureth sulfate (e.g., sodium lauryl/laureth sulfate, ammonium lauryl sulfate).

[00203] In an embodiment, the invention includes compositions that may be conditioners. For example, the conditioners of the invention may include one or more conditioning agents. Conditioning agents may include glycerol, propylene glycol, erithritol, sodium PCA, hyaluronic acid, sorbitol, fructose, fatty acids (e.g., stearic acid and oleic acid), fatty alcohols, sorbitol, fructose, a polyquaternium polymer, a cationic surfactant, proteins, amino acids, oils, mineral oil, silicons, fatty acid esters, glycerin, cetrimonium chloride, fatty alcohols, and dimethicone.

[00204] In an embodiment, the invention includes compositions that may be deodorants and/or antiperspirants. The deodorants and/or antiperspirants of the invention may include one or more of an aluminum based compound, mineral salts (e.g., aluminum mineral salts), talcum powder, sodium bicarbonate, sodium stearate, witch hazel, baking soda, hops, aloe vera, and one or more essential oils that provide antibacterial and/or antifungal properties (e.g., lemongrass oil, eucalyptus oil, tea tree oil, and rosemary oil). The aluminum based compound may include one or more of aluminum chloride, aluminum chlorohydrate, aluminum-zirconium compounds, aluminum zirconium tetrachlorohydrex gly, aluminum zirconium trichlorohydrex gly, aluminum sesquichlorohydrate, and aluminum sesquichlorohydrex compounds. The mineral salts may include one or more of potassium alum and ammonium alum.

Sunscreen

[00205] The compositions of the invention (e.g., moisturizer compositions) may include a sunscreen or sunblock. For example, the sunscreen or sunblock may include one or more of a physical UV blocker and a chemical UV blocker. The physical UV blockers may include one or more of titanium dioxide, zinc oxide, micronized titanium dioxide, micronized zinc oxide, and oil soluble zinc oxide. The chemical UV blockers may include one or more of octylcrylene,

avobenzone, octinoxate, octisalate, oxybenzone, homosalate, helioplex, 4-MBC, mexoryl SX and XL, tinosorb S and M, uvinul T 150, and uvinul A plus.

[00206] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of about 50 wt. %, about 45 wt. %, about 40 wt. %, about 35 wt. %, about 30 wt. %, about 25 wt. %, about 20 wt. %, about 19.75 wt. %, about 19.50 wt. %, about 19.25 wt. %, about 19 wt. %, about 18.75 wt. %, about 18.50 wt. %, about 18.25 wt. %, about 18 wt. %, about 17.75 wt. %, about 17.50 wt. %, about 17.25 wt. %, about 17 wt. %, about 16.75 wt. %, about 16.50 wt. %, about 16.25 wt. % about 16 wt. %, about 15.75 wt. %, about 15.50 wt. %, about 15.25 wt. %, about 15 wt. %, about 14.75 wt. %, about 14.50 wt. %, about 14.25 wt. %, about 14 wt. %, about 13.75 wt. %, about 13.50 wt. %, about 13.25 wt. %, about 13 wt. %, about 12.75 wt. %, about 12.50 wt. %, about 12.25 wt. %, about 12 wt. %, about 11.75 wt. %, about 11.50 wt. %, about 11.25 wt. %, about 11 wt. %, about 10.75 wt. %, about 10.50 wt. %, about 10.25 wt. %, about 10 wt. %, about 9.75 wt. %, about 9.50 wt. %, about 9.25 wt. %, about 9 wt. %, about 8.75 wt. %, about 8.50 wt. %, about 8.25 wt. %, about 8 wt. %, about 7.75 wt. %, about 7.50 wt. %, about 7.25 wt. %, about 7 wt. %, about 6.75 wt. %, about 6.50 wt. %, about 6.25 wt. %, about 6 wt. %, about 5.75 wt. %, about 5.50 wt. %, about 5.25 wt. %, about 5 wt. %, about 4.75 wt. %, about 4.50 wt. %, about 4.25 wt. %, about 4 wt. %, about 3.75 wt. %, about 3.50 wt. %, about 3.25 wt. %, about 3 wt. %, about 2.75 wt. %, about 2.50 wt. %, about 2.25 wt. %, about 2 wt. %, about 1.75 wt. %, about 1.50 wt. %, about 1.25 wt. %, about 1 wt. %, about 0.5 wt. %, about 0.4 wt. %, about 0.3 wt. %, about 0.2 wt. %, about 0.1 wt. %, about 0.09 wt. %, about 0.08 wt. %, about 0.07 wt. %, about 0.06 wt. %, about 0.05 wt. %, about 0.04 wt. %, about 0.03 wt. %, about 0.02 wt. %, about 0.01 wt. %, about 0.009 wt. %, about 0.008 wt. %, about 0.007 wt. %, about 0.006 wt. %, about 0.005 wt. %, about 0.004 wt. %, about 0.003 wt. %, about 0.002 wt. %, or about 0.001 wt. %.

[00207] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of between about 1 wt. % to about 50 wt. %, between about 2 wt. % to about 40 wt. %, between about 3 wt. % to about 30 wt. %, between about 4 wt. % to about 20 wt. %, between about 5 wt. % to about 15 wt. %, between about 6 wt. % to about 10 wt. %, between about 7 wt. % to about 9 wt. %, between about 10 wt. % to about 50 wt. %, between about 15 wt. % to about 45 wt. %, between

about 20 wt. % to about 40 wt. %, between about 25 wt. % to about 35 wt. %, or between about 25 wt. % to about 30 wt. %.

[00208] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of between about 0.001 wt. % to about 5 wt. %, between about 5 wt. % to about 10 wt. %, between about 10 wt. % to about 15 wt. %, between about 15 wt. % to about 20 wt. %, between about 20 wt. % to about 25 wt. %, between about 25 wt. % to about 30 wt. %, between about 30 wt. % to about 35 wt. %, between about 35 wt. % to about 40 wt. %, between about 40 wt. % to about 45 wt. %, or between about 45 wt. % to about 50 wt. %.

[00209] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of between about 0.001 wt. % to about 1 wt. %, between about 1 wt. % to about 2 wt. %, between about 2 wt. % to about 3 wt. %, between about 3 wt. % to about 4 wt. %, between about 4 wt. % to about 5 wt. %, between about 5 wt. % to about 6 wt. %, between about 6 wt. % to about 7 wt. %, between about 7 wt. % to about 8 wt. %, between about 8 wt. % to about 9 wt. %, between about 9 wt. % to about 10 wt. %, between about 10 wt. % to about 11 wt. %, between about 11 wt. % to about 12 wt. %, between about 12 wt. % to about 13 wt. %, between about 13 wt. % to about 14 wt. %, between about 14 wt. % to about 15 wt. %, between about 15 wt. % to about 16 wt. %, between about 16 wt. % to about 17 wt. %, between about 17 wt. % to about 18 wt. %, between about 18 wt. % to about 19 wt. %, between about 19 wt. % to about 20 wt. %, between about 20 wt. % to about 21 wt. %, between about 21 wt. % to about 22 wt. %, between about 22 wt. % to about 23 wt. %, between about 23 wt. % to about 24 wt. %, between about 24 wt. % to about 25 wt. %, between about 25 wt. % to about 26 wt. %, between about 26 wt. % to about 27 wt. %, between about 27 wt. % to about 28 wt. %, between about 28 wt. % to about 29 wt. %, between about 29 wt. % to about 30 wt. %, between about 30 wt. % to about 31 wt. %, between about 31 wt. % to about 32 wt. %, between about 32 wt. % to about 33 wt. %, between about 33 wt. % to about 34 wt. %, between about 34 wt. % to about 35 wt. %, between about 35 wt. % to about 36 wt. %, between about 36 wt. % to about 37 wt. %, between about 37 wt. % to about 38 wt. %, between about 38 wt. % to about 39 wt. %, between about 39 wt. % to about 40 wt. %, between about 40 wt. % to about 41 wt. %, between about 41 wt. % to about 42 wt. %, between about 42 wt. % to about 43 wt. %, between about 43 wt. % to about 44 wt. %, between about 44 wt. % to about 45 wt. %, between about 45 wt.

% to about 46 wt. %, between about 46 wt. % to about 47 wt. %, between about 47 wt. % to about 48 wt. %, between about 48 wt. % to about 49 wt. %, or between about 49 wt. % to about 50 wt. %.

[00210] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of 50 wt. %, 45 wt. %, 40 wt. %, 35 wt. %, 30 wt. %, 25 wt. %, 20 wt. %, 19.75 wt. %, 19.50 wt. %, 19.25 wt. %, 19 wt. %, 18.75 wt. %, 18.50 wt. %, 18.25 wt. %, 18 wt. %, 17.75 wt. %, 17.50 wt. %, 17.25 wt. %, 17 wt. %, 16.75 wt. %, 16.50 wt. %, 16.25 wt. % 16 wt. %, 15.75 wt. %, 15.50 wt. %, 15.25 wt. %, 15 wt. %, 14.75 wt. %, 14.50 wt. %, 14.25 wt. %, 14 wt. %, 13.75 wt. %, 13.50 wt. %, 13.25 wt. %, 13 wt. %, 12.75 wt. %, 12.50 wt. %, 12.25 wt. %, 12 wt. %, 11.75 wt. %, 11.50 wt. %, 11.25 wt. %, 11 wt. %, 10.75 wt. %, 10.50 wt. %, 10.25 wt. %, 10 wt. %, 9.75 wt. %, 9.50 wt. %, 9.25 wt. %, 9 wt. %, 8.75 wt. %, 8.50 wt. %, 8.25 wt. %, 8 wt. %, 7.75 wt. %, 7.50 wt. %, 7.25 wt. %, 7 wt. %, 6.75 wt. %, 6.50 wt. %, 6.25 wt. %, 6 wt. %, 5.75 wt. %, 5.50 wt. %, 5.25 wt. %, 5 wt. %, 4.75 wt. %, 4.50 wt. %, 4.25 wt. %, 4 wt. %, 3.75 wt. %, 3.50 wt. %, 3.25 wt. %, 3 wt. %, 2.75 wt. %, 2.50 wt. %, 2.25 wt. %, 2 wt. %, 1.75 wt. %, 1.50 wt. %, 1.25 wt. %, 1 wt. %, 0.5 wt. %, 0.4 wt. %, 0.3 wt. %, 0.2 wt. %, 0.1 wt. %, 0.09 wt. %, 0.08 wt. %, 0.07 wt. %, 0.06 wt. %, 0.05 wt. %, 0.04 wt. %, 0.03 wt. %, 0.02 wt. %, 0.01 wt. %, 0.009 wt. %, 0.008 wt. %, 0.007 wt. %, 0.006 wt. %, 0.005 wt. %, 0.004 wt. %, 0.003 wt. %, 0.002 wt. %, or 0.001 wt. %.

[00211] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of between 1 wt. % to 50 wt. %, between 2 wt. % to 40 wt. %, between 3 wt. % to 30 wt. %, between 4 wt. % to 20 wt. %, between 5 wt. % to 15 wt. %, between 6 wt. % to 10 wt. %, between 7 wt. % to 9 wt. %, between 10 wt. % to 50 wt. %, between 15 wt. % to 45 wt. %, between 20 wt. % to 40 wt. %, between 25 wt. % to 35 wt. %, or between 30 wt. % to 35 wt. %.

[00212] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of between 0.001 wt. % to 5 wt. %, between 5 wt. % to 10 wt. %, between 10 wt. % to 15 wt. %, between 15 wt. % to 20 wt. %, between 20 wt. % to 25 wt. %, between 25 wt. % to 30 wt. %, between 30 wt. % to 35 wt. %, between 35 wt. % to 40 wt. %, between 40 wt. % to 45 wt. %, or between 45 wt. % to 50 wt. %.

[00213] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of between 0.001 wt. % to 1 wt. %, between 1 wt. % to 2 wt. %, between 2 wt. % to 3 wt. %, between 3 wt. % to 4 wt. %, between 4 wt. % to 5 wt. %, between 5 wt. % to 6 wt. %, between 6 wt.

% to 7 wt. %, between 7 wt. % to 8 wt. %, between 8 wt. % to 9 wt. %, between 9 wt. % to 10 wt. %, between 10 wt. % to 11 wt. %, between 11 wt. % to 12 wt. %, between 12 wt. % to 13 wt. %, between 13 wt. % to 14 wt. %, between 14 wt. % to 15 wt. %, between 15 wt. % to 16 wt. %, between 16 wt. % to 17 wt. %, between 17 wt. % to 18 wt. %, between 18 wt. % to 19 wt. %, between 19 wt. % to 20 wt. %, between 20 wt. % to 21 wt. %, between 21 wt. % to 22 wt. %, between 22 wt. % to 23 wt. %, between 23 wt. % to 24 wt. %, between 24 wt. % to 25 wt. %, between 25 wt. % to 26 wt. %, between 26 wt. % to 27 wt. %, between 27 wt. % to 28 wt. %, between 28 wt. % to 29 wt. %, between 29 wt. % to 30 wt. %, between 30 wt. % to 31 wt. %, between 31 wt. % to 32 wt. %, between 32 wt. % to 33 wt. %, between 33 wt. % to 34 wt. %, between 34 wt. % to 35 wt. %, between 35 wt. % to 36 wt. %, between 36 wt. % to 37 wt. %, between 37 wt. % to 38 wt. %, between 38 wt. % to 39 wt. %, between 39 wt. % to 40 wt. %, between 40 wt. % to 41 wt. %, between 41 wt. % to 42 wt. %, between 42 wt. % to 43 wt. %, between 43 wt. % to 44 wt. %, between 44 wt. % to 45 wt. %, between 45 wt. % to 46 wt. %, between 46 wt. % to 47 wt. %, between 47 wt. % to 48 wt. %, between 48 wt. % to 49 wt. %, or between 49 wt. % to 50 wt. %.

[00214] In an embodiment, a moisturizer composition further includes an amount of a sunscreen of less than 50 wt. %, less than 40 wt. %, less than 30 wt. %, less than 20 wt. %, less than 19.75 wt. %, less than 19.50 wt. %, less than 19.25 wt. %, less than 19 wt. %, less than 18.75 wt. %, less than 18.50 wt. %, less than 18.25 wt. %, less than 18 wt. %, less than 17.75 wt. %, less than 17.50 wt. %, less than 17.25 wt. %, less than 17 wt. %, less than 16.75 wt. %, less than 16.50 wt. %, less than 16.25 wt. % less than 16 wt. %, less than 15.75 wt. %, less than 15.50 wt. %, less than 15.25 wt. %, less than 15 wt. %, less than 14.75 wt. %, less than 14.50 wt. %, less than 14.25 wt. %, less than 14 wt. %, less than 13.75 wt. %, less than 13.50 wt. %, less than 13.25 wt. %, less than 13 wt. %, less than 12.75 wt. %, less than 12.50 wt. %, less than 12.25 wt. %, less than 12 wt. %, less than 11.75 wt. %, less than 11.50 wt. %, less than 11.25 wt. %, less than 11 wt. %, less than 10.75 wt. %, less than 10.50 wt. %, less than 10.25 wt. %, less than 10 wt. %, less than 9.75 wt. %, less than 9.50 wt. %, less than 9.25 wt. %, less than 9 wt. %, less than 8.75 wt. %, less than 8.50 wt. %, less than 8.25 wt. %, less than 8 wt. %, less than 7.75 wt. %, less than 7.50 wt. %, less than 7.25 wt. %, less than 7 wt. %, less than 6.75 wt. %, less than 6.50 wt. %, less than 6.25 wt. %, less than 6 wt. %, less than 5.75 wt. %, less than 5.50 wt. %, less than 5.25 wt. %, less than 5 wt. %, less than 4.75 wt. %, less

than 4.50 wt. %, less than 4.25 wt. %, less than 4 wt. %, less than 3.75 wt. %, less than 3.50 wt. %, less than 3.25 wt. %, less than 3 wt. %, less than 2.75 wt. %, less than 2.50 wt. %, less than 2.25 wt. %, less than 2 wt. %, less than 1.75 wt. %, less than 1.50 wt. %, less than 1.25 wt. %, less than 1 wt. %, less than 0.5 wt. %, less than 0.4 wt. %, less than 0.3 wt. %, less than 0.2 wt. %, less than 0.1 wt. %, less than 0.09 wt. %, less than 0.08 wt. %, less than 0.07 wt. %, less than 0.06 wt. %, less than 0.05 wt. %, less than 0.04 wt. %, less than 0.03 wt. %, less than 0.02 wt. %, less than 0.01 wt. %, less than 0.009 wt. %, less than 0.008 wt. %, less than 0.007 wt. %, less than 0.006 wt. %, less than 0.005 wt. %, less than 0.004 wt. %, less than 0.003 wt. %, less than 0.002 wt. %, or less than 0.001 wt. %.

[00215] In an embodiment, the moisturizer composition further includes an amount of a sunscreen of greater than 45 wt. %, greater than 40 wt. %, greater than 30 wt. %, greater than 20 wt. %, greater than 19.75 wt. %, greater than 19.50 wt. %, greater than 19.25 wt. %, greater than 19 wt. %, greater than 18.75 wt. %, greater than 18.50 wt. %, greater than 18.25 wt. %, greater than 18 wt. %, greater than 17.75 wt. %, greater than 17.50 wt. %, greater than 17.25 wt. %, greater than 17 wt. %, greater than 16.75 wt. %, greater than 16.50 wt. %, greater than 16.25 wt. % greater than 16 wt. %, greater than 15.75 wt. %, greater than 15.50 wt. %, greater than 15.25 wt. %, greater than 15 wt. %, greater than 14.75 wt. %, greater than 14.50 wt. %, greater than 14.25 wt. %, greater than 14 wt. %, greater than 13.75 wt. %, greater than 13.50 wt. %, greater than 13.25 wt. %, greater than 13 wt. %, greater than 12.75 wt. %, greater than 12.50 wt. %, greater than 12.25 wt. %, greater than 12 wt. %, greater than 11.75 wt. %, greater than 11.50 wt. %, greater than 11.25 wt. %, greater than 11 wt. %, greater than 10.75 wt. %, greater than 10.50 wt. %, greater than 10.25 wt. %, greater than 10 wt. %, greater than 9.75 wt. %, greater than 9.50 wt. %, greater than 9.25 wt. %, greater than 9 wt. %, greater than 8.75 wt. %, greater than 8.50 wt. %, greater than 8.25 wt. %, greater than 8 wt. %, greater than 7.75 wt. %, greater than 7.50 wt. %, greater than 7.25 wt. %, greater than 7 wt. %, greater than 6.75 wt. %, greater than 6.50 wt. %, greater than 6.25 wt. %, greater than 6 wt. %, greater than 5.75 wt. %, greater than 5.50 wt. %, greater than 5.25 wt. %, greater than 5 wt. %, greater than 4.75 wt. %, greater than 4.50 wt. %, greater than 4.25 wt. %, greater than 4 wt. %, greater than 3.75 wt. %, greater than 3.50 wt. %, greater than 3.25 wt. %, greater than 3 wt. %, greater than 2.75 wt. %, greater than 2.50 wt. %, greater than 2.25 wt. %, greater than 2 wt. %, greater than 1.75 wt. %, greater than 1.50 wt. %, greater than 1.25 wt. %, greater than 1 wt. %,

greater than 0.5 wt. %, greater than 0.4 wt. %, greater than 0.3 wt. %, greater than 0.2 wt. %, greater than 0.1 wt. %, greater than 0.09 wt. %, greater than 0.08 wt. %, greater than 0.07 wt. %, greater than 0.06 wt. %, greater than 0.05 wt. %, greater than 0.04 wt. %, greater than 0.03 wt. %, greater than 0.02 wt. %, greater than 0.01 wt. %, greater than 0.009 wt. %, greater than 0.008 wt. %, greater than 0.007 wt. %, greater than 0.006 wt. %, greater than 0.005 wt. %, greater than 0.004 wt. %, greater than 0.003 wt. %, greater than 0.002 wt. %, or greater than 0.001 wt. %.

[00216] In an embodiment, a sunscreen has a sun protection factor of 5, 10, 15, 20, 25, 30, 35, 40, 45, or 50. In an embodiment, a sunscreen has a sun protection factor of 5 to 10, 10 to 15, 15 to 20, 20 to 25, 25 to 30, 30 to 35, 35 to 40, 40 to 45, or 45 to 50. In an embodiment, a sunscreen has a sun protection factor of greater than 5, greater than 10, greater than 15, greater than 20, greater than 25, greater than 30, greater than 35, greater than 40, greater than 45, or greater than 50. In an embodiment, a sunscreen has a sun protection factor of less than 5, less than 10, less than 15, less than 20, less than 25, less than 30, less than 35, less than 40, less than 45, or less than 50.

[00217] In an embodiment, a moisturizer composition further includes an amount of a sunblock of about 50 wt. %, about 45 wt. %, about 40 wt. %, about 35 wt. %, about 30 wt. %, about 25 wt. %, about 20 wt. %, about 19.75 wt. %, about 19.50 wt. %, about 19.25 wt. %, about 19 wt. %, about 18.75 wt. %, about 18.50 wt. %, about 18.25 wt. %, about 18 wt. %, about 17.75 wt. %, about 17.50 wt. %, about 17.25 wt. %, about 17 wt. %, about 16.75 wt. %, about 16.50 wt. %, about 16.25 wt. % about 16 wt. %, about 15.75 wt. %, about 15.50 wt. %, about 15.25 wt. %, about 15 wt. %, about 14.75 wt. %, about 14.50 wt. %, about 14.25 wt. %, about 14 wt. %, about 13.75 wt. %, about 13.50 wt. %, about 13.25 wt. %, about 13 wt. %, about 12.75 wt. %, about 12.50 wt. %, about 12.25 wt. %, about 12 wt. %, about 11.75 wt. %, about 11.50 wt. %, about 11.25 wt. %, about 11 wt. %, about 10.75 wt. %, about 10.50 wt. %, about 10.25 wt. %, about 10 wt. %, about 9.75 wt. %, about 9.50 wt. %, about 9.25 wt. %, about 9 wt. %, about 8.75 wt. %, about 8.50 wt. %, about 8.25 wt. %, about 8 wt. %, about 7.75 wt. %, about 7.50 wt. %, about 7.25 wt. %, about 7 wt. %, about 6.75 wt. %, about 6.50 wt. %, about 6.25 wt. %, about 6 wt. %, about 5.75 wt. %, about 5.50 wt. %, about 5.25 wt. %, about 5 wt. %, about 4.75 wt. %, about 4.50 wt. %, about 4.25 wt. %, about 4 wt. %, about 3.75 wt. %, about 3.50 wt. %, about 3.25 wt. %, about 3 wt. %, about 2.75 wt. %, about 2.50 wt. %, about 2.25 wt. %, about 2 wt. %, about 1.75 wt. %, about 1.50 wt. %, about 1.25 wt. %, about 1 wt.

%, about 0.5 wt. %, about 0.4 wt. %, about 0.3 wt. %, about 0.2 wt. %, about 0.1 wt. %, about 0.09 wt. %, about 0.08 wt. %, about 0.07 wt. %, about 0.06 wt. %, about 0.05 wt. %, about 0.04 wt. %, about 0.03 wt. %, about 0.02 wt. %, about 0.01 wt. %, about 0.009 wt. %, about 0.008 wt. %, about 0.007 wt. %, about 0.006 wt. %, about 0.005 wt. %, about 0.004 wt. %, about 0.003 wt. %, about 0.002 wt. %, or about 0.001 wt. %.

[00218] In an embodiment, a moisturizer composition further includes an amount of a sunblock of between about 1 wt. % to about 50 wt. %, between about 2 wt. % to about 40 wt. %, between about 3 wt. % to about 30 wt. %, between about 4 wt. % to about 20 wt. %, between about 5 wt. % to about 15 wt. %, between about 6 wt. % to about 10 wt. %, between about 7 wt. % to about 9 wt. %, between about 10 wt. % to about 50 wt. %, between about 15 wt. % to about 45 wt. %, between about 20 wt. % to about 40 wt. %, between about 25 wt. % to about 35 wt. %, or between about 25 wt. % to about 30 wt. %.

[00219] In an embodiment, a moisturizer composition further includes an amount of a sunblock of between about 0.001 wt. % to about 5 wt. %, between about 5 wt. % to about 10 wt. %, between about 10 wt. % to about 15 wt. %, between about 15 wt. % to about 20 wt. %, between about 20 wt. % to about 25 wt. %, between about 25 wt. % to about 30 wt. %, between about 30 wt. % to about 35 wt. %, between about 35 wt. % to about 40 wt. %, between about 40 wt. % to about 45 wt. %, or between about 45 wt. % to about 50 wt. %.

[00220] In an embodiment, a moisturizer composition further includes an amount of a sunblock of between about 0.001 wt. % to about 1 wt. %, between about 1 wt. % to about 2 wt. %, between about 2 wt. % to about 3 wt. %, between about 3 wt. % to about 4 wt. %, between about 4 wt. % to about 5 wt. %, between about 5 wt. % to about 6 wt. %, between about 6 wt. % to about 7 wt. %, between about 7 wt. % to about 8 wt. %, between about 8 wt. % to about 9 wt. %, between about 9 wt. % to about 10 wt. %, between about 10 wt. % to about 11 wt. %, between about 11 wt. % to about 12 wt. %, between about 12 wt. % to about 13 wt. %, between about 13 wt. % to about 14 wt. %, between about 14 wt. % to about 15 wt. %, between about 15 wt. % to about 16 wt. %, between about 16 wt. % to about 17 wt. %, between about 17 wt. % to about 18 wt. %, between about 18 wt. % to about 19 wt. %, between about 19 wt. % to about 20 wt. %, between about 20 wt. % to about 21 wt. %, between about 21 wt. % to about 22 wt. %, between about 22 wt. % to about 23 wt. %,

between about 23 wt. % to about 24 wt. %, between about 24 wt. % to about 25 wt. %, between about 25 wt. % to about 26 wt. %, between about 26 wt. % to about 27 wt. %, between about 27 wt. % to about 28 wt. %, between about 28 wt. % to about 29 wt. %, between about 29 wt. % to about 30 wt. %, between about 30 wt. % to about 31 wt. %, between about 31 wt. % to about 32 wt. %, between about 32 wt. % to about 33 wt. %, between about 33 wt. % to about 34 wt. %, between about 34 wt. % to about 35 wt. %, between about 35 wt. % to about 36 wt. %, between about 36 wt. % to about 37 wt. %, between about 37 wt. % to about 38 wt. %, between about 38 wt. % to about 39 wt. %, between about 39 wt. % to about 40 wt. %, between about 40 wt. % to about 41 wt. %, between about 41 wt. % to about 42 wt. %, between about 42 wt. % to about 43 wt. %, between about 43 wt. % to about 44 wt. %, between about 44 wt. % to about 45 wt. %, between about 45 wt. % to about 46 wt. %, between about 46 wt. % to about 47 wt. %, between about 47 wt. % to about 48 wt. %, between about 48 wt. % to about 49 wt. %, or between about 49 wt. % to about 50 wt. %.

[00221] In an embodiment, a moisturizer composition further includes an amount of a sunblock of 50 wt. %, 45 wt. %, 40 wt. %, 35 wt. %, 30 wt. %, 25 wt. %, 20 wt. %, 19.75 wt. %, 19.50 wt. %, 19.25 wt. %, 19 wt. %, 18.75 wt. %, 18.50 wt. %, 18.25 wt. %, 18 wt. %, 17.75 wt. %, 17.50 wt. %, 17.25 wt. %, 17 wt. %, 16.75 wt. %, 16.50 wt. %, 16.25 wt. % 16 wt. %, 15.75 wt. %, 15.50 wt. %, 15.25 wt. %, 15 wt. %, 14.75 wt. %, 14.50 wt. %, 14.25 wt. %, 14 wt. %, 13.75 wt. %, 13.50 wt. %, 13.25 wt. %, 13 wt. %, 12.75 wt. %, 12.50 wt. %, 12.25 wt. %, 12 wt. %, 11.75 wt. %, 11.50 wt. %, 11.25 wt. %, 11 wt. %, 10.75 wt. %, 10.50 wt. %, 10.25 wt. %, 10 wt. %, 9.75 wt. %, 9.50 wt. %, 9.25 wt. %, 9 wt. %, 8.75 wt. %, 8.50 wt. %, 8.25 wt. %, 8 wt. %, 7.75 wt. %, 7.50 wt. %, 7.25 wt. %, 7 wt. %, 6.75 wt. %, 6.50 wt. %, 6.25 wt. %, 6 wt. %, 5.75 wt. %, 5.50 wt. %, 5.25 wt. %, 5 wt. %, 4.75 wt. %, 4.50 wt. %, 4.25 wt. %, 4 wt. %, 3.75 wt. %, 3.50 wt. %, 3.25 wt. %, 3 wt. %, 2.75 wt. %, 2.50 wt. %, 2.25 wt. %, 2 wt. %, 1.75 wt. %, 1.50 wt. %, 1.25 wt. %, 1 wt. %, 0.5 wt. %, 0.4 wt. %, 0.3 wt. %, 0.2 wt. %, 0.1 wt. %, 0.09 wt. %, 0.08 wt. %, 0.07 wt. %, 0.06 wt. %, 0.05 wt. %, 0.04 wt. %, 0.03 wt. %, 0.02 wt. %, 0.01 wt. %, 0.009 wt. %, 0.008 wt. %, 0.007 wt. %, 0.006 wt. %, 0.005 wt. %, 0.004 wt. %, 0.003 wt. %, 0.002 wt. %, or 0.001 wt. %.

[00222] In an embodiment, a moisturizer composition further includes an amount of a sunblock of between 1 wt. % to 50 wt. %, between 2 wt. % to 40 wt. %, between 3 wt. % to 30 wt. %, between 4 wt. % to 20 wt. %, between 5 wt. % to 15 wt. %, between 6 wt. % to 10 wt. %, between 7

wt. % to 9 wt. %, between 10 wt. % to 50 wt. %, between 15 wt. % to 45 wt. %, between 20 wt. % to 40 wt. %, between 25 wt. % to 35 wt. %, or between 30 wt. % to 35 wt. %.

[00223] In an embodiment, a moisturizer composition further includes an amount of a sunblock of between 0.001 wt. % to 5 wt. %, between 5 wt. % to 10 wt. %, between 10 wt. % to 15 wt. %, between 15 wt. % to 20 wt. %, between 20 wt. % to 25 wt. %, between 25 wt. % to 30 wt. %, between 30 wt. % to 35 wt. %, between 35 wt. % to 40 wt. %, between 40 wt. % to 45 wt. %, or between 45 wt. % to 50 wt. %.

[00224] In an embodiment, a moisturizer composition further includes an amount of a sunblock of between 0.001 wt. % to 1 wt. %, between 1 wt. % to 2 wt. %, between 2 wt. % to 3 wt. %, between 3 wt. % to 4 wt. %, between 4 wt. % to 5 wt. %, between 5 wt. % to 6 wt. %, between 6 wt. % to 7 wt. %, between 7 wt. % to 8 wt. %, between 8 wt. % to 9 wt. %, between 9 wt. % to 10 wt. %, between 10 wt. % to 11 wt. %, between 11 wt. % to 12 wt. %, between 12 wt. % to 13 wt. %, between 13 wt. % to 14 wt. %, between 14 wt. % to 15 wt. %, between 15 wt. % to 16 wt. %, between 16 wt. % to 17 wt. %, between 17 wt. % to 18 wt. %, between 18 wt. % to 19 wt. %, between 19 wt. % to 20 wt. %, between 20 wt. % to 21 wt. %, between 21 wt. % to 22 wt. %, between 22 wt. % to 23 wt. %, between 23 wt. % to 24 wt. %, between 24 wt. % to 25 wt. %, between 25 wt. % to 26 wt. %, between 26 wt. % to 27 wt. %, between 27 wt. % to 28 wt. %, between 28 wt. % to 29 wt. %, between 29 wt. % to 30 wt. %, between 30 wt. % to 31 wt. %, between 31 wt. % to 32 wt. %, between 32 wt. % to 33 wt. %, between 33 wt. % to 34 wt. %, between 34 wt. % to 35 wt. %, between 35 wt. % to 36 wt. %, between 36 wt. % to 37 wt. %, between 37 wt. % to 38 wt. %, between 38 wt. % to 39 wt. %, between 39 wt. % to 40 wt. %, between 40 wt. % to 41 wt. %, between 41 wt. % to 42 wt. %, between 42 wt. % to 43 wt. %, between 43 wt. % to 44 wt. %, between 44 wt. % to 45 wt. %, between 45 wt. % to 46 wt. %, between 46 wt. % to 47 wt. %, between 47 wt. % to 48 wt. %, between 48 wt. % to 49 wt. %, or between 49 wt. % to 50 wt. %.

[00225] In an embodiment, a moisturizer composition further includes an amount of a sunblock of less than 50 wt. %, less than 40 wt. %, less than 30 wt. %, less than 20 wt. %, less than 19.75 wt. %, less than 19.50 wt. %, less than 19.25 wt. %, less than 19 wt. %, less than 18.75 wt. %, less than 18.50 wt. %, less than 18.25 wt. %, less than 18 wt. %, less than 17.75 wt. %, less than 17.50 wt. %,

less than 17.25 wt. %, less than 17 wt. %, less than 16.75 wt. %, less than 16.50 wt. %, less than 16.25 wt. % less than 16 wt. %, less than 15.75 wt. %, less than 15.50 wt. %, less than 15.25 wt. %, less than 15 wt. %, less than 14.75 wt. %, less than 14.50 wt. %, less than 14.25 wt. %, less than 14 wt. %, less than 13.75 wt. %, less than 13.50 wt. %, less than 13.25 wt. %, less than 13 wt. %, less than 12.75 wt. %, less than 12.50 wt. %, less than 12.25 wt. %, less than 12 wt. %, less than 11.75 wt. %, less than 11.50 wt. %, less than 11.25 wt. %, less than 11 wt. %, less than 10.75 wt. %, less than 10.50 wt. %, less than 10.25 wt. %, less than 10 wt. %, less than 9.75 wt. %, less than 9.50 wt. %, less than 9.25 wt. %, less than 9 wt. %, less than 8.75 wt. %, less than 8.50 wt. %, less than 8.25 wt. %, less than 8 wt. %, less than 7.75 wt. %, less than 7.50 wt. %, less than 7.25 wt. %, less than 7 wt. %, less than 6.75 wt. %, less than 6.50 wt. %, less than 6.25 wt. %, less than 6 wt. %, less than 5.75 wt. %, less than 5.50 wt. %, less than 5.25 wt. %, less than 5 wt. %, less than 4.75 wt. %, less than 4.50 wt. %, less than 4.25 wt. %, less than 4 wt. %, less than 3.75 wt. %, less than 3.50 wt. %, less than 3.25 wt. %, less than 3 wt. %, less than 2.75 wt. %, less than 2.50 wt. %, less than 2.25 wt. %, less than 2 wt. %, less than 1.75 wt. %, less than 1.50 wt. %, less than 1.25 wt. %, less than 1 wt. %, less than 0.5 wt. %, less than 0.4 wt. %, less than 0.3 wt. %, less than 0.2 wt. %, less than 0.1 wt. %, less than 0.09 wt. %, less than 0.08 wt. %, less than 0.07 wt. %, less than 0.06 wt. %, less than 0.05 wt. %, less than 0.04 wt. %, less than 0.03 wt. %, less than 0.02 wt. %, less than 0.01 wt. %, less than 0.009 wt. %, less than 0.008 wt. %, less than 0.007 wt. %, less than 0.006 wt. %, less than 0.005 wt. %, less than 0.004 wt. %, less than 0.003 wt. %, less than 0.002 wt. %, or less than 0.001 wt. %.

[00226] In an embodiment, the moisturizer composition further includes an amount of a sunblock of greater than 45 wt. %, greater than 40 wt. %, greater than 30 wt. %, greater than 20 wt. %, greater than 19.75 wt. %, greater than 19.50 wt. %, greater than 19.25 wt. %, greater than 19 wt. %, greater than 18.75 wt. %, greater than 18.50 wt. %, greater than 18.25 wt. %, greater than 18 wt. %, greater than 17.75 wt. %, greater than 17.50 wt. %, greater than 17.25 wt. %, greater than 17 wt. %, greater than 16.75 wt. %, greater than 16.50 wt. %, greater than 16.25 wt. % greater than 16 wt. %, greater than 15.75 wt. %, greater than 15.50 wt. %, greater than 15.25 wt. %, greater than 15 wt. %, greater than 14.75 wt. %, greater than 14.50 wt. %, greater than 14.25 wt. %, greater than 14 wt. %, greater than 13.75 wt. %, greater than 13.50 wt. %, greater than 13.25 wt. %, greater than 13 wt. %, greater than 12.75 wt. %, greater than 12.50 wt. %, greater than 12.25 wt. %, greater than 12 wt. %, greater

than 11.75 wt. %, greater than 11.50 wt. %, greater than 11.25 wt. %, greater than 11 wt. %, greater than 10.75 wt. %, greater than 10.50 wt. %, greater than 10.25 wt. %, greater than 10 wt. %, greater than 9.75 wt. %, greater than 9.50 wt. %, greater than 9.25 wt. %, greater than 9 wt. %, greater than 8.75 wt. %, greater than 8.50 wt. %, greater than 8.25 wt. %, greater than 8 wt. %, greater than 7.75 wt. %, greater than 7.50 wt. %, greater than 7.25 wt. %, greater than 7 wt. %, greater than 6.75 wt. %, greater than 6.50 wt. %, greater than 6.25 wt. %, greater than 6 wt. %, greater than 5.75 wt. %, greater than 5.50 wt. %, greater than 5.25 wt. %, greater than 5 wt. %, greater than 4.75 wt. %, greater than 4.50 wt. %, greater than 4.25 wt. %, greater than 4 wt. %, greater than 3.75 wt. %, greater than 3.50 wt. %, greater than 3.25 wt. %, greater than 3 wt. %, greater than 2.75 wt. %, greater than 2.50 wt. %, greater than 2.25 wt. %, greater than 2 wt. %, greater than 1.75 wt. %, greater than 1.50 wt. %, greater than 1.25 wt. %, greater than 1 wt. %, greater than 0.5 wt. %, greater than 0.4 wt. %, greater than 0.3 wt. %, greater than 0.2 wt. %, greater than 0.1 wt. %, greater than 0.09 wt. %, greater than 0.08 wt. %, greater than 0.07 wt. %, greater than 0.06 wt. %, greater than 0.05 wt. %, greater than 0.04 wt. %, greater than 0.03 wt. %, greater than 0.02 wt. %, greater than 0.01 wt. %, greater than 0.009 wt. %, greater than 0.008 wt. %, greater than 0.007 wt. %, greater than 0.006 wt. %, greater than 0.005 wt. %, greater than 0.004 wt. %, greater than 0.003 wt. %, greater than 0.002 wt. %, or greater than 0.001 wt. %.

[00227] In an embodiment, a sunblock has a sun protection factor of 5, 10, 15, 20, 25, 30, 35, 40, 45, or 50. In an embodiment, a sunblock has a sun protection factor of 5 to 10, 10 to 15, 15 to 20, 20 to 25, 25 to 30, 30 to 35, 35 to 40, 40 to 45, or 45 to 50. In an embodiment, a sunblock has a sun protection factor of greater than 5, greater than 10, greater than 15, greater than 20, greater than 25, greater than 30, greater than 35, greater than 40, greater than 45, or greater than 50. In an embodiment, a sunblock has a sun protection factor of less than 5, less than 10, less than 15, less than 20, less than 25, less than 30, less than 35, less than 40, less than 45, or less than 50.

[00228] Sun protection factor is a dimensionless quantity known to those of skill in the art. A sun protection factor, or sun protection rating, is a measure of the fraction of UV rays that reach the skin. For example, a sun protection factor of 10 means that 1/10 of the UV rays that cause sunburn will reach the skin, thus allowing a person that experiences sunburn after 30 minutes to instead experience sunburn after 300 minutes. In an embodiment, the UV rays blocked by the sunscreen or

sunblock may be ultraviolet type A (UV-A) radiation with a wavelength range of about 320-400 nm, ultraviolet type B (UV-B) radiation with a wavelength rage of about 320-290 nm, or ultraviolet type C (UV-C) radiation with a wavelength range of about 290-100 nm.

[00229] In an embodiment, the invention includes compositions comprising sunscreen and sunblock compounds, including organic molecules that absorb UV-A, UV-B, and/or UV-C radiation, inorganic particles that scatter UV-A, UV-B, and/or UV-C radiation, and organic particles that both absorb and scatter UV-A, UV-B, and/or UV-C radiation. In an embodiment, sunscreen and sunblock compounds include amiloxate (isopentyl-4-methoxycinnamate), *para*-aminobenzoic acid, Benzophenone-9 (sodium dihydroxy dimethoxy disulfobenzophenone), padimate O (octyldimethyl *para*-aminobenzoic acid), phenylbenzimidazole sulfonic acid, cinoxate, dioxybenzone, oxybenzone, homosalate, menthyl anthranilate, 4-methylbenzylidene camphor, Mexoryl XL (drometrizole trisiloxane), Neo Heliopan AP (disodium phenyl dibenzimidazole tetrasulfonate), octocrylene, octyl methoxycinnamate, octyl salicylate, sulisobenzone, Tinosorb M (bisoctrizole, methylene *bis*-benzotriazolyl tetramethylbutylphenol), Tinosorb S (*bis*-ethylhexyloxyphenol methoxyphenol triazine), Tinsorb A2B (*tris*-biphenyl triazine), trolamine salicylate, avobenzone, ecamsule, titanium dioxide, Uvinul T 150 (octyl triazone), Uvinul A Plus (diethylamino hydroxybenzoyl hexyl benzoate), Parsol SLX (dimethico-diethylbenzalmalonate), and zinc oxide.

Cleansers

[00230] The present invention may include compositions that may be cleansers. For example, the cleansers of the invention may include stearic acid cleansers (which may contain stearic acid), lauric acid cleansers (which may contain lauric acid), and combination cleansers. The cleansers of the invention may include one or more cleansing agents. Cleansing agents include fatty acids as described herein, such as lauric acid, stearic acid, myristic acid, and oleic acid, and olive oil. Additional cleansing agents may include one or more of non-ionic surfactants, soaps (e.g., oils described herein that are combined with a caustic agent, such as NaOH and/or KOH), sodium lauryl sulfate, sodium laureth sulfate, palmitic acid, and ammonium laureth sulfate.

[00231]

Preparation of Moisturizer Compositions

[00232] In an embodiment, the extraction temperature during a method of preparing a composition of the present disclosure is greater than 84°C. In an embodiment, the extraction temperature during a method of preparing a composition of the present disclosure is less than 100°C. In an embodiment, the extraction temperature during a method of preparing a composition of the present disclosure is 84°C to 100°C. In an embodiment, the extraction temperature during a method of preparing a composition of the present disclosure is 84°C to 94°C. In an embodiment, the extraction temperature during a method of preparing a composition of the present disclosure is 94°C to 100°C.

[00233] Fig. 1 is a flow chart showing various embodiments for producing pure silk fibroin-based protein fragments (SPFs) of the present disclosure. It should be understood that not all of the steps illustrated are necessarily required to fabricate all silk solutions of the present disclosure. As illustrated in Fig. 1, step A, cocoons (heat-treated or non-heat-treated), silk fibers, silk powder or spider silk can be used as the silk source.

[00234] If starting from raw silk cocoons from *Bombyx mori*, the cocoons can be cut into small pieces, for example pieces of approximately equal size, step B1. The raw silk is then extracted and rinsed to remove any sericin, step C1a. This results in substantially sericin free raw silk. In an embodiment, water is heated to a temperature between 84°C and 100°C (ideally boiling) and then Na_2CO_3 (sodium carbonate) is added to the boiling water until the Na_2CO_3 is completely dissolved. The raw silk is added to the boiling water/Na_2CO_3 (100°C) and submerged for approximately 15 - 90 minutes, where boiling for a longer time results in smaller silk protein fragments. In an embodiment, the water volume equals about 0.4 x raw silk weight and the Na_2CO_3 volume equals about 0.848 x raw silk weight. In an embodiment, the water volume equals 0.1 x raw silk weight and the Na_2CO_3 volume is maintained at 2.12 g/L. This is demonstrated in Fig. 62A and Fig. 62B: silk mass (x-axis) was varied in the same volume of extraction solution (i.e., the same volume of water and concentration of Na_2CO_3) achieving sericin removal (substantially sericin free) as demonstrated by an overall silk mass loss of 26 to 31 percent (y-axis). Subsequently, the water dissolved Na_2CO_3 solution is drained and excess water/Na_2CO_3 is removed from the silk fibroin fibers (e.g., ring out the fibroin extract by hand, spin cycle using a machine, etc.). The resulting silk fibroin extract is rinsed with warm to hot water to remove any remaining adsorbed sericin or contaminate, typically at

a temperature range of about 40°C to about 80°C, changing the volume of water at least once (repeated for as many times as required). The resulting silk fibroin extract is a substantially sericin-depleted silk fibroin. In an embodiment, the resulting silk fibroin extract is rinsed with water at a temperature of about 60°C. In an embodiment, the volume of rinse water for each cycle equals 0.1 L to 0.2 L x raw silk weight. It may be advantageous to agitate, turn or circulate the rinse water to maximize the rinse effect. After rinsing, excess water is removed from the extracted silk fibroin fibers (e.g., ring out fibroin extract by hand or using a machine). Alternatively, methods known to one skilled in the art such as pressure, temperature, or other reagents or combinations thereof may be used for the purpose of sericin extraction. Alternatively, the silk gland (100% sericin free silk protein) can be removed directly from a worm. This would result in liquid silk protein, without any alteration of the protein structure, free of sericin.

[00235] The extracted fibroin fibers are then allowed to dry completely. Fig. 3 is a photograph showing dry extracted silk fibroin. Once dry, the extracted silk fibroin is dissolved using a solvent added to the silk fibroin at a temperature between ambient and boiling, step C1b. In an embodiment, the solvent is a solution of Lithium bromide (LiBr) (boiling for LiBr is 140°C). Alternatively, the extracted fibroin fibers are not dried but wet and placed in the solvent; solvent concentration can then be varied to achieve similar concentrations as to when adding dried silk to the solvent. The final concentration of LiBr solvent can range from 0.1M to 9.3M. Fig. 63 is a table summarizing the Molecular Weights of silk dissolved from different concentrations of Lithium Bromide (LiBr) and from different extraction and dissolution sizes. Complete dissolution of the extracted fibroin fibers can be achieved by varying the treatment time and temperature along with the concentration of dissolving solvent. Other solvents may be used including, but not limited to, phosphate phosphoric acid, calcium nitrate, calcium chloride solution or other concentrated aqueous solutions of inorganic salts. To ensure complete dissolution, the silk fibers should be fully immersed within the already heated solvent solution and then maintained at a temperature ranging from about 60°C to about 140°C for 1-168 hrs. In an embodiment, the silk fibers should be fully immersed within the solvent solution and then placed into a dry oven at a temperature of about 100°C for about 1 hour.

[00236] The temperature at which the silk fibroin extract is added to the LiBr solution (or vice versa) has an effect on the time required to completely dissolve the fibroin and on the resulting

molecular weight and polydispersity of the final SPF mixture solution. In an embodiment, silk solvent solution concentration is less than or equal to 20% w/v. In addition, agitation during introduction or dissolution may be used to facilitate dissolution at varying temperatures and concentrations. The temperature of the LiBr solution will provide control over the silk protein fragment mixture molecular weight and polydispersity created. In an embodiment, a higher temperature will more quickly dissolve the silk offering enhanced process scalability and mass production of silk solution. In an embodiment, using a LiBr solution heated to a temperature between 80°C -140°C reduces the time required in an oven in order to achieve full dissolution. Varying time and temperature at or above 60°C of the dissolution solvent will alter and control the MW and polydispersity of the SPF mixture solutions formed from the original molecular weight of the native silk fibroin protein.

[00237] Alternatively, whole cocoons may be placed directly into a solvent, such as LiBr, bypassing extraction, step B2. This requires subsequent filtration of silk worm particles from the silk and solvent solution and sericin removal using methods know in the art for separating hydrophobic and hydrophilic proteins such as a column separation and/or chromatography, ion exchange, chemical precipitation with salt and/or pH, and or enzymatic digestion and filtration or extraction, all methods are common examples and without limitation for standard protein separation methods, step C2. Non-heat treated cocoons with the silkworm removed, may alternatively be placed into a solvent such as LiBr, bypassing extraction. The methods described above may be used for sericin separation, with the advantage that non-heat treated cocoons will contain significantly less worm debris.

[00238] Dialysis may be used to remove the dissolution solvent from the resulting dissolved fibroin protein fragment solution by dialyzing the solution against a volume of water, step E1. Pre-filtration prior to dialysis is helpful to remove any debris (i.e., silk worm remnants) from the silk and LiBr solution, step D. In one example, a 3μm or 5μm filter is used with a flow-rate of 200-300mL/min to filter a 0.1% to 1.0% silk- LiBr solution prior to dialysis and potential concentration if desired. A method disclosed herein, as described above, is to use time and/or temperature to decrease the concentration from 9.3M LiBr to a range from 0.1M to 9.3M to facilitate filtration and downstream dialysis, particularly when considering creating a scalable process method.

Alternatively, without the use of additional time or temperate, a 9.3M LiBr-silk protein fragment solution may be diluted with water to facilitate debris filtration and dialysis. The result of dissolution at the desired time and temperate filtration is a translucent particle-free room temperature shelf-stable silk protein fragment-LiBr solution of a known MW and polydispersity. It is advantageous to change the dialysis water regularly until the solvent has been removed (e.g., change water after 1 hour, 4 hours, and then every 12 hours for a total of 6 water changes). The total number of water volume changes may be varied based on the resulting concentration of solvent used for silk protein dissolution and fragmentation. After dialysis, the final silk solution maybe further filtered to remove any remaining debris (i.e., silk worm remnants).

[00239] Alternatively, Tangential Flow Filtration (TFF), which is a rapid and efficient method for the separation and purification of biomolecules, may be used to remove the solvent from the resulting dissolved fibroin solution, step E2. TFF offers a highly pure aqueous silk protein fragment solution and enables scalability of the process in order to produce large volumes of the solution in a controlled and repeatable manner. The silk and LiBr solution may be diluted prior to TFF (20% down to 0.1% silk in either water or LiBr). Pre-filtration as described above prior to TFF processing may maintain filter efficiency and potentially avoids the creation of silk gel boundary layers on the filter's surface as the result of the presence of debris particles. Pre-filtration prior to TFF is also helpful to remove any remaining debris (i.e., silk worm remnants) from the silk and LiBr solution that may cause spontaneous or long-term gelation of the resulting water only solution, step D. TFF, recirculating or single pass, may be used for the creation of water-silk protein fragment solutions ranging from 0.1% silk to 30.0% silk (more preferably, 0.1% - 6.0% silk). Different cutoff size TFF membranes may be required based upon the desired concentration, molecular weight and polydispersity of the silk protein fragment mixture in solution. Membranes ranging from 1-100 kDa may be necessary for varying molecular weight silk solutions created for example by varying the length of extraction boil time or the time and temperate in dissolution solvent (e.g., LiBr). In an embodiment, a TFF 5 or 10 kDa membrane is used to purify the silk protein fragment mixture solution and to create the final desired silk-to-water ratio. As well, TFF single pass, TFF, and other methods known in the art, such as a falling film evaporator, may be used to concentrate the solution following removal of the dissolution solvent (e.g., LiBr) (with resulting desired concentration ranging from 0.1% to 30% silk). This can be used as an alternative to standard HFIP concentration

methods known in the art to create a water-based solution. A larger pore membrane could also be utilized to filter out small silk protein fragments and to create a solution of higher molecular weight silk with and/or without tighter polydispersity values. Fig. 61 is a table summarizing Molecular Weights for some embodiments of silk protein solutions of the present disclosure. Silk protein solution processing conditions were as follows: 100°C extraction for 20 min, room temperature rinse, Li Br in 60°C oven for 4-6 hours. TFF processing conditions for water-soluble films were as follows: 100°C extraction for 60 min, 60°C rinse., 100°C LiBr in 100°C oven for 60 min. Figs, 67-78 further demonstrate manipulation of extraction time, LiBr dissolution conditions, and TFF processing and resultant example molecular weights and polydispersities. These examples are not intended to be limiting, but rather to demonstrate the potential of specifying parameters for specific molecular weight silk fragment solutions.

[00240] An assay for LiBr and Na_2CO_3 detection was performed using an HPLC system equipped with evaporative light scattering detector (ELSD). The calculation was performed by linear regression of the resulting peak areas for the analyte plotted against concentration. More than one sample of a number of formulations of the present disclosure was used for sample preparation and analysis. Generally, four samples of different formulations were weighed directly in a 10 mL volumetric flask. The samples were suspended in 5 mL of 20mM ammonium formate (pH 3.0) and kept at 2-8°C for 2 hours with occasional shaking to extract analytes from the film. After 2 hours the solution was diluted with 20mM ammonium formate (pH 3.0). The sample solution from the volumetric flask was transferred into HPLC vials and injected into the HPLC-ELSD system for the estimation of sodium carbonate and lithium bromide.

[00241] The analytical method developed for the quantitation of Na_2CO_3 and LiBr in silk protein formulations was found to be linear in the range 10 - 165 µg/mL, with RSD for injection precision as 2% and 1% for area and 0.38% and 0.19% for retention time for sodium carbonate and lithium bromide respectively. The analytical method can be applied for the quantitative determination of sodium carbonate and lithium bromide in silk protein formulations.

[00242] The final silk protein fragment solution, as shown in Fig. 4, is pure silk protein fragments and water with PPM to undetectable levels of particulate debris and/or process contaminants, including LiBr and Na_2CO_3. Fig. 55 and Fig. 58 are tables summarizing LiBr and Na_2CO_3

concentrations in solutions of the present disclosure, in Fig. 55, the processing conditions included 100°C extraction for 60 min, 60°C rinse, 100°C LiBr in 100°C oven for 60 min. TFF conditions including pressure differential and number of dia-filtration volumes were varied. In Fig. 58, the processing conditions included 100°C boil for 60 min, 60°C rinse, LiBr in 60°C oven for 4-6 hours. In an embodiment, a SPF composition of the present disclosure is not soluble in an aqueous solution due to the crystallinity of the protein, in an embodiment, a SPF composition of the present disclosure is soluble in an aqueous solution. In an embodiment, the SPFs of a composition of the present disclosure include a crystalline portion of about two-thirds and an amorphous region of about one -third. In an embodiment, the SPFs of a composition of the present disclosure include a crystalline portion of about one-half and an amorphous region of about one-half, in an embodiment, the SPFs of a composition of the present disclosure include a 99% crystalline portion and a 1% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 95% crystalline portion and a 5% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 90% crystalline portion and a 10% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include an 85% crystalline portion and a 15% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include an 80% crystalline portion and a 20% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 75% crystalline portion and a 25% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 70% crystalline portion and a 30% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 65% crystalline portion and a 35% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 60% crystalline portion and a 40% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 50% crystalline portion and a 50% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 40% crystalline portion and a 60% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 35% crystalline portion and a 65% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 30% crystalline portion and a 70% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 25% crystalline portion and a 75% amorphous region. In an embodiment, the SPFs of a composition of the present

disclosure include a 20% crystalline portion and an 80% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 15% crystalline portion and an 85% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 10% crystalline portion and a 90% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 5% crystalline portion and a 90% amorphous region. In an embodiment, the SPFs of a composition of the present disclosure include a 1% crystalline portion and a 99% amorphous region.

[00243] A unique feature of the SPF compositions of the present disclosure is shelf stability (they will not slowly or spontaneously gel when stored in an aqueous solution and there is no aggregation of fragments and therefore no increase in molecular weight-over time), from 10 days to 3 years depending on storage conditions, percent silk, and number of shipments and shipment conditions. Additionally pH may be altered to extend shelf-life and/or support shipping conditions by preventing premature folding and aggregation of the silk. In an embodiment, a SPF solution composition of the present disclosure has a shelf stability for up to 2 weeks at room temperature (RT). In an embodiment, a SPF solution composition of the present disclosure has a shelf stability for up to 4 weeks at RT. In an embodiment, a SPF solution composition of the present disclosure has a shelf stability for up to 6 weeks at RT. In an embodiment, a SPF solution composition of the present disclosure has a shelf stability for up to 8 weeks at RT. In an embodiment, a SPF solution composition of the present disclosure has a shelf stability for up to 10 weeks at RT. In an embodiment, a SPF solution composition of the present disclosure has a shelf stability for up to 12 weeks at RT. In an embodiment, a SPF solution composition of the present disclosure has a shelf stability ranging from about 4 weeks to about 52 weeks at RT. Table 1 below shows shelf stability test results for embodiments of SPF compositions of the present disclosure.

Table 1. Shelf Stability of SPF Compositions of the Present Disclosure

% Silk	Temperature	Time to Gelation
2	RT	4 weeks
2	4C	>9 weeks
4	RT	4 weeks
4	4C	>9 weeks

6	RT	2 weeks
6	4C	>9 weeks

[00244] A known additive such as a vitamin (e.g., vitamin C, Vitamin B, or Vitamin A,) can be added to a SPF composition of the present disclosure to create a gel that is stable from 10 days to 3 years at room temperature (RT). Both examples, a SPF composition and the same with an additive, can be lyophilized for enhanced storage control ranging from 10 days to 10 years depending on storage and shipment conditions. The lyophilized silk powder can also be used as a raw ingredient in the medical, consumer, and electronic markets. Additionally, lyophilized silk powder can be resuspended in water, HFIP, or organic solution following storage to create silk solutions of varying concentrations, including higher concentration solutions than those produced initially. In another embodiment, the silk fibroin-based protein fragments are dried using a rototherrn evaporator or other methods known in the art for creating a dry protein form containing less than 10% water by mass.

[00245] Either the silk fragment-water solutions or the lyophilized silk protein fragment mixture can be sterilized following standard methods in the art not limited to filtration, heat, radiation or e-beam. It is anticipated that the silk protein fragment mixture, because of its shorter protein polymer length, will withstand sterilization better than intact silk protein solutions described in the art. Additionally, silk articles created from the SPF mixtures described herein may be sterilized as appropriate to application. For example, a silk film loaded with a molecule to be used in medical applications with an open wound/incision, may be sterilized standard methods such as by radiation or e-beam.

[00246] Fig, 2 is a flow chart showing various parameters that can be modified during the process of producing a silk protein fragment solution of the present disclosure during the extraction and the dissolution steps. Select method parameters may be altered to achieve distinct final solution characteristics depending upon the intended use, e.g., molecular weight and polydispersity. It should be understood that not all of the steps illustrated are necessarily required to fabricate all silk solutions of the present disclosure.

[00247] In an embodiment, a process for producing a silk protein fragment solution of the present disclosure includes forming pieces of silk cocoons from the *Bombyx mori* silk worm; extracting the pieces at about 100°C in a solution of water and Na_2CO_3 for about 60 minutes, wherein a volume of

the water equals about 0.4 x raw silk weight and the amount of Na_2CO_3 is about 0.848 x the weight of the pieces to form a silk fibroin extract; triple rinsing the silk fibroin extract at about 60°C for about 20 minutes per rinse in a volume of rinse water, wherein the rinse water for each cycle equals about 0.2 L x the weight of the pieces; removing excess water from the silk fibroin extract; drying the silk fibroin extract; dissolving the dry silk fibroin extract in a LiBr solution, wherein the LiBr solution is first heated to about 100°C to create a silk and LiBr solution and maintained; placing the silk and LiBr solution in a dry oven at about 100°C for about 60 minutes to achieve complete dissolution and further fragmentation of the native silk protein structure into mixture with desired molecular weight and polydispersity; filtering the solution to remove any remaining debris from the silkworm; diluting the solution with water to result in a 1% silk solution; and removing solvent from the solution using Tangential Flow Filtration (TFF). In an embodiment, a 10 kDa membrane is utilized to purify the silk solution and create the final desired silk-to-water ratio. TFF can then be used to further concentrate the pure silk solution to a concentration of 2% silk to water.

[00248] Each process step from raw cocoons to dialysis is scalable to increase efficiency in manufacturing. Whole cocoons are currently purchased as the raw material, but pre-cleaned cocoons or non-heat treated cocoons, where worm removal leaves minimal debris, have also been used. Cutting and cleaning the cocoons is a manual process, however for scalability this process could be made less labor intensive by, for example, using an automated machine in combination with compressed air to remove the worm and any particulates, or using a cutting mill to cut the cocoons into smaller pieces. The extraction step, currently performed in small batches, could be completed in a larger vessel, for example an industrial washing machine where temperatures at or in between 60°C to 100°C can be maintained. The rinsing step could also be completed in the industrial washing machine, eliminating the manual rinse cycles. Dissolution of the silk in LiBr solution could occur in a vessel other than a convection oven, for example a stirred tank reactor. Dialyzing the silk through a series of water changes is a manual and time intensive process, which could be accelerated by changing certain parameters, for example diluting the silk solution prior to dialysis. The dialysis process could be scaled for manufacturing by using semi-automated equipment, for example a tangential flow filtration system.

[00249] Varying extraction (i.e., time and temperature), LiBr (i.e., temperature of LiBr solution when added to silk fibroin extract or vice versa) and dissolution (i.e., time and temperature)

parameters results in solvent and silk solutions with different viscosities, homogeneities, and colors (see Figs, 5-32). Increasing the temperature for extraction, lengthening the extraction time, using a higher temperature LiBr solution at emersion and over time when dissolving the silk and increasing the time at temperature (e.g., in an oven as shown here, or an alternative heat source) all resulted in less viscous and more homogeneous solvent and silk solutions. While almost all parameters resulted in a viable silk solution, methods that allow complete dissolution to be achieved in fewer than 4 to 6 hours are preferred for process scalability.

[00250] Figs. 5-10 show photographs of four different silk extraction combinations tested: 90°C 30 min, 90°C 60 min, 100°C 30 min, and 100°C 60 min. Briefly, 9.3 M LiBr was prepared and allowed to sit at room temperature for at least 30 minutes. 5 mL of LiBr solution was added to 1.25 g of silk and placed in the 60°C oven. Samples from each set were removed at 4, 6, 8, 12, 24, 168 and 192 hours. The remaining sample was photographed.

[00251] Figs. 11-23 show photographs of four different silk extraction combinations tested: 90°C 30 min, 90°C 60 min, 100°C 30 min, and 100°C 60 min. Briefly, 9.3 M LiBr solution was heated to one of four temperatures: 60°C, 80°C, 100°C or boiling. 5 mL of hot LiBr solution was added to 1.25 g of silk and placed in the 60°C oven. Samples from each set were removed at 1, 4 and 6 hours. The remaining sample was photographed.

[00252] Figs. 24-32 show photographs of four different silk extraction combinations tested: Four different silk extraction combinations were used: 90°C 30 min, 90°C 60 mm, 100°C 30 min, and 100°C 60 min. Briefly, 9.3 M LiBr solution was heated to one of four temperatures: 60°C, 80°C, 100°C or boiling. 5 mL of hot LiBr solution was added to 1.25 g of silk and placed in the oven at the same temperature of the LiBr. Samples from each set were removed at 1, 4 and 6 hours. 1 mL of each sample was added to 7.5 mL of 9.3 M LiBr and refrigerated for viscosity testing. The remaining sample was photographed.

[00253] Molecular weight of the silk protein fragments may be controlled based upon the specific parameters utilized during the extraction step, including extraction time and temperature; specific parameters utilized during the dissolution step, including the LiBr temperature at the time of submersion of the silk in to the lithium bromide and time that the solution is maintained at specific temperatures; and specific parameters utilized during the filtration step. By controlling process parameters using the disclosed methods, it is possible to create SPF mixture solutions with

polydispersity equal to or lower than 2.5 at a variety of different molecular weight ranging from 5 kDa to 200 kDa, more preferably between 10 kDa and 80 kDA. By altering process parameters to achieve silk solutions with different molecular weights, a range of fragment mixture end products, with desired polydispersity of equal to or less than 2.5 may be targeted based upon the desired performance requirements. For example, a lower molecular weight silk film containing a drug may have a faster release rate compared to a higher molecular weight film making it more ideal for a daily delivery vehicle in consumer cosmetics. Additionally, SPF mixture solutions with a polydispersity of greater than 2.5 can be achieved. Further, two solutions with different average molecular weights and polydispersities can be mixed to create combination solutions. Alternatively, a liquid silk gland (100% sericin free silk protein) that has been removed directly from a worm could be used in combination with any of the SPF mixture solutions of the present disclosure. Molecular weight of the pure silk fibroin-based protein fragment composition was determined using High Pressure Liquid Chromatography (HPLC) with a Refractive Index Detector (RID). Polydispersity was calculated using Citrus GPC Online GPC/SEC Software Version 3.3 (Agilent).

[00254] Parameters were varied during the processing of raw silk cocoons into silk solution. Varying these parameters affected the MW of the resulting silk solution. Parameters manipulated included (i) time and temperature of extraction, (ii) temperature of LiBr, (iii) temperature of dissolution oven, and (iv) dissolution time. Molecular weight was determined with mass spec as shown in Figs, 64-80.

[00255] Experiments were carried out to determine the effect of varying the extraction time. Figs. 64-70 are graphs showing these results, and Tables 2-8 summarize the results. Below is a summary:

[00256] — A sericin extraction time of 30 minutes resulted in larger MW than a sericin extraction time of 60 minutes

[00257] — MW decreases with time in the oven

[00258] — 140°C LiBr and oven resulted in the low end of the confidence interval to be below a MW of 9500 Da

[00259] — 30 min extraction at the 1 hour and 4 hour time points have undigested silk

[00260] — 30 min extraction at the 1 hour time point resulted in a significantly high molecular weight with the low end of the confidence interval being 35,000 Da

[00261] — The range of MW reached for the high end of the confidence interval was 18000 to 216000 Da (important for offering solutions with specified upper limit)

[00262]

Table 2. The effect of extraction time (30 min vs 60 min) on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 100°C Lithium Bromide (LiBr) and 100°C Oven Dissolution (Oven/Dissolution Time was varied).

Boil Time	Oven Time	Average Mw	Std dev	Confidence Interval		PD
30	1	57247	12780	35093	93387	1.63
60	1	31520	1387	11633	85407	2.71
30	4	40973	2632	14268	117658	2.87
60	4	25082	1248	10520	59803	2.38
30	6	25604	1405	10252	63943	2.50
60	6	20980	1262	10073	43695	2.08

[00263] Table 3. The effect of extraction time (30 min vs 60 min) on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, boiling Lithium Bromide (LiBr) and 60°C Oven Dissolution for 4 hr.

[00264]

Sample	Boil Time	Average Mw	Std dev	Confidence Interval		PD
30 min, 4 hr	30	49656	4580	17306	142478	2.87
60 min, 4 hr	60	30042	1536	11183	80705	2.69

[00265] Table 4. The effect of extraction time (30 min vs 60 min) on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 60°C Lithium Bromide (LiBr) and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

Sample	Boil Time	Oven Time	Average Mw	Std dev	Confidence Interval		PD
30 min, 1 hr	30	1	58436		22201	153809	2.63
60 min, 1 hr	60	1	31700		11931	84224	2.66
30 min, 4 hr	30	4	61956.5	13337	21463	178847	2.89
60 min, 4 hr	60	4	25578.5	2446	9979	65564	2.56

Table 5. The effect of extraction time (30 min vs 60 min) on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 80°C Lithium Bromide (LiBr) and 80°C Oven Dissolution for 6 hr.

Sample	Boil Time	Average Mw	Std dev	Confidence Interval		PD
30 min, 6 hr	30	63510		18693	215775	3.40
60 min, 6 hr	60	25164	238	9637	65706	2.61

Table 6. The effect of extraction time (30 min vs 60 min) on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 80°C Lithium Bromide (LiBr) and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

Sample	Boil Time	Oven Time	Average Mw	Std dev	Confidence Interval		PD
30 min, 4 hr	30	4	59262	14628	19073	183760	3.10
60 min, 4 hr	60	4	26312.5	637	10266	67442	2.56
30 min, 6 hr	30	6	46824		18076	121293	2.59
60 min, 6 hr	60	6	26353		10168	68302	2.59

[00266]

[00267] Table 7. The effect of extraction time (30 min vs 60 min) on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 100°C Lithium Bromide (LiBr) and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

Sample	Boil Time	Oven Time	Average Mw	Std dev	Confidence Interval		PD
30 min, 4 hr	30	4	47853		19758	115900	2.42
60 min, 4 hr	60	4	25082	1248	10520	59804	2.38
30 min, 6 hr	30	6	55421	8992	19153	160366	2.89
60 min, 6 hr	60	6	20980	1262	10073	43694	2.08

[00268]

[00269] Table 8. The effect of extraction time (30 min vs 60 min) on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 140°C Lithium Bromide (LiBr) and 140°C Oven Dissolution (Oven/Dissolution Time was varied).

Sample	Boil Time	Oven Time	Average Mw	Std dev	Confidence Interval		PD
30 min, 4 hr	30	4	9024.5	1102	4493	18127	2.00865
60 min, 4 hr	60	4	15548		6954	34762	2.2358
30 min, 6 hr	30	6	13021		5987	28319	2.1749
60 min, 6 hr	60	6	10888		5364	22100	2.0298

[00270]

[00271] Experiments were carried out to determine the effect of varying the extraction temperature. Fig,, 71 is a graph showing these results, and Table 9 summarizes the results. Below is a summary:

[00272] -- Sericin extraction at 90°C resulted in higher MW than sericin extraction at 100°C extraction

[00273] — Both 90°C and 100°C show decreasing MW over time in the oven

[00274] Table 9. The effect of extraction temperature (90°C vs. 100°C) on molecular weight of silk processed under the conditions of 60 min. Extraction Temperature, 100°C Lithium Bromide (LiBr) and 100°C Oven Dissolution (Oven/Dissolution Time was varied).

Sample	Boil Time	Oven Time	Average Mw	Std dev	Confidence Interval		PD
90C, 4 hr	60	4	37308	4204	13368	104119	2.79
100C, 4 hr	60	4	25082	1248	10520	59804	2.38
90C, 6 hr	60	6	34224	1135	12717	92100	2.69
100C, 6 hr	60	6	20980	1262	10073	43694	2.08

[00275]

[00276] Experiments were carried out to determine the effect of varying the Lithium Bromide (LiBr) temperature when added to silk. Figs. 72-73 are graphs showing these results, and Tables 10-11 summarize the results. Below is a summary:

[00277] — No impact on MW or confidence interval (all CI -10500-6500 Da)

[00278] — Studies illustrated that the temperature of Li Br-silk dissolution, as LiBr is added and begins dissolving, rapidly drops below the original LiBr temperature due to the majority of the mass being silk at room

Table 10. The effect of Lithium Bromide (LiBr) temperature on molecular weight of silk processed under the conditions of 60 min. Extraction Time., 100°C Extraction Temperature and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

Sample	LiBr Temp (°C)	Oven Time	Average Mw	Std dev	Confidence Interval		PD
60C LiBr, 1hr	60	1	31700		11931	84223	2.66
100C LiBr, 1hr	100	1	27907	200	10735	72552	2.60
RT LiBr, 4hr	RT	4	29217	1082	10789	79119	2.71
60C LiBr, 4hr	60	4	25578	2445	9978	65564	2.56
80C LiBr, 4hr	80	4	26312	637	10265	67441	2.56
100C LiBr, 4hr	100	4	27681	1729	11279	67931	2.45
Boil LiBr, 4hr	Boil	4	30042	1535	11183	80704	2.69
RT LiBr, 6hr	RT	6	26543	1893	10783	65332	2.46
80C LiBr, 6hr	80	6	26353		10167	68301	2.59
100C LiBr, 6hr	100	6	27150	916	11020	66889	2.46

[00279]

[00280] Table 11. The effect of Lithium Bromide (LiBr) temperature on molecular weight processed under the conditions of 30 min. Extraction Time, 100°C Extraction temperature and 60°C Oven Dissolution (Oven/Dissolution Time was varied).

Sample	LiBr Temp (°C)	Oven Time	Average Mw	Std dev	Confidence Interval		PD
60C LiBr, 4hr	60	4	61956	13336	21463	178847	2.89
80C LiBr, 4hr	80	4	59202	14027	19073	183760	3.10
100C LiBr, 4hr	100	4	47853		19757	115899	2.42
80C LiBr, 6hr	80	6	46824		18075	121292	2.59
100C LiBr, 6hr	100	6	55421	8991	19152	160366	2.89

[00281]

[00282] Experiments were carried out to determine the effect of v oven/dissolution temperature. Figs. 74-78 are graphs showing these results, and Tables 12-16 summarize the results. Below is a summary:

[00283] — Oven temperature has less of an effect on 60 min extracted silk than 30 min extracted silk. Without wishing to be bound by theory, it is believed that the 30 min silk is less degraded

during extraction and therefore the oven temperature has more of an effect on the larger MW, less degraded portion of the silk.

[00284] — For 60°C vs. 140°C oven the 30 min extracted silk showed a very significant effect of lower MW at higher oven temp, while 60 min extracted silk had an effect but much less

[00285] — The 140°C oven resulted in a low end in the confidence interval at ~6000 Da

[00286] Table 12. The effect of oven/dissolution temperature on molecular weight of silk !processed under the conditions of 100°C Extraction Temperature, 30 min. Extraction Time, and 100°C Lithium Bromide (LiBr) (Oven/Dissolution Time was varied).

Boil Time	Oven Temp (°C)	Oven Time	Average Mw	Std dev	Confidence Interval		PD
30	60	4	47853		19758	115900	2.42
30	100	4	40973	2632	14268	117658	2.87
30	60	6	55421	8992	19153	160366	2.89
30	100	6	25604	1405	10252	63943	2.50

[00287] Table 13. The effect of oven/dissolution temperature on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 60 min. Extraction Time, and 100°C Lithium Bromide (LiBr) Oven/Dissolution Time was varied).

[00288]

Boil Time	Oven Temp (°C)	Oven Time	Average Mw	Std dev	Confidence Interval		PD
60	60	1	27908	200	10735	72552	2.60
60	100	1	31520	1387	11633	85407	2.71
60	60	4	27681	1730	11279	72552	2.62
60	100	4	25082	1248	10520	59803	2.38
60	60	6	27150	916	11020	66889	2.46
60	100	6	20980	1262	10073	43695	2.08

[00289] Table 14. The effect of oven/dissolution temperature on molecular weight of silk [processed under the conditions of 100°C Extraction Temperature, 60 min. Extraction Time, and 140°C Lithium Bromide (LiBr) (Oven/Dissolution Time was varied).

[00290]

Boil Time	Oven Temp(°C)	Oven Time	Average Mw	Std dev	Confidence Interval		PD
60	60	4	30042	1536	11183	80705	2.69
60	140	4	15548		7255	33322	2.14

[00291] Table 15. The effect of oven/dissolution temperature on molecular weight of silk [processed under the conditions of 100°C Extraction Temperature, 30 min. Extraction Time, and 140°C Lithium Bromide LiBr) Oven/Dissolution Time was varied).

Boil Time	Oven Temp (°C)	Oven Time	Average Mw	Std dev	Confidence Interval		PD
30	60	4	49656	4580	17306	142478	2.87
30	140	4	9025	1102	4493	18127	2.01
30	60	6	59383	11640	17641	199869	3.37
30	140	6	13021		5987	28319	2.17

[00292]

[00293] Table 16. The effect of oven/dissolution temperature on molecular weight of silk processed under the conditions of 100°C Extraction Temperature, 60 min. Extraction Time, and 80°C Lithium Bromide (LiBr) (Oven/Dissolution Time was varied).

Boil Time	Oven Temp (°C)	Oven Time	Average Mw	Std dev	Confidence Interval		PD
60	60	4	26313	637	10266	67442	2.56
60	80	4	30308	4293	12279	74806	2.47
60	60	6	26353		10168	68302	2.59
60	80	6	25164	238	9637	65706	2.61

[00294] In an embodiment, the methods disclosed herein result in a solution with characteristics that can be controlled during manufacturing, including, but not limited to: MW - may be varied by changing extraction and/or dissolution time and temp (e.g., LiBr temperature), pressure, and filtration (e.g., size exclusion chromatography); Structure – removal or cleavage of heavy or light chain of the fibroin protein polymer; Purity - hot water rinse temperature for improved sericin removal or filter capability for improved particulate removal that adversely affects shelf stability of the silk fragment protein mixture solution; Color - the color of the solution can be controlled with, for example, LiBr temp and time; Viscosity; Clarity; and Stability of solution. The resultant pH of the solution is typically about 7 and can be altered using an acid or base as appropriate to storage requirements.

[00295] The above-described SPF mixture solutions may be utilized to produce a pure silk protein fragment-film, pure silk protein fragment-gel, or pure silk protein fragment moisturizing composition for numerous applications (e.g., delivery of a drug, vitamin, antioxidant, etc. to the skin). Fig, 33 is a flow chart showing an embodiment for producing a silk film of the present disclosure from a silk solution of the present disclosure. In step A, a silk solution of the present disclosure is chosen, and then at least on molecule or therapeutic agent is added directly to the silk solution prior to gel or film processing, step B. When producing a silk film, the silk solution with additive(s) may be cast directly onto a shaped mold to achieve a unique film shape (e.g., silicone mold) or the silk solution may be cast as a sheet and then subsequently cut or punched into a variety of shapes, with a variety of cutting techniques, including, but not limited to cutting with a rotary blade or laser cutting for example (Figs. 83A and 83B), depending upon the desired application, step C. If cast on a mold, for example silicone, the silicone mold may be heated on a laser-etched/patterned surface to create an impression that will be transferred to the final film. For example, the product logo could be transferred to the film, visible, but not palpable by hand, and used to show authenticity of the product. The concentration and/or mass of the final silk protein fragment film can be varied to control the film's degree of flexibility and conformity to different anatomical topographies. Altering the drying method for a silk film will also result in different final film characteristics. Applying airflow and/or heat impacts the properties of the film (e.g., brittleness, number of bubbles, curling, solubility, surface appearance), step D. Additionally, the percent moisture within the film at the time of packaging will impact stability over time with too much moisture resulting in yellowing of the films with time (Figs. 82A-82C). In some embodiments, films ideally may have between about 2 to about 20% water content at completion of drying. It was observed that greater moisture content than 20% in the films will decrease shelf life. If films are not dry enough (that is they have greater than 20% water content) before packaging, they will yellow over time (2+ weeks). It is advised that films are dried in an incubator until the relative humidity in the incubator is less than the relative humidity in the surrounding area and no greater than 36%. Ambient humidity will have an effect on the ability to remove moisture and therefore, a tactile/audio test can be used to determine whether films are ready for packaging. In an embodiment, the test includes removal of a film from the drying system, slightly bending one end of the film and releasing it. If the film feels and sounds similar to a piece of paper or thin plastic, it is considered

dry. If the film has not completed drying, it will be pliable and will make no noise upon bending and release. In an embodiment, the film is flexible without the need for process additives such as glycerin, such that a film that is 2.5cm wide by 10cm long can be bent in half so that opposite ends of the film can touch one another without the film breaking or cracking. A film of this same size can be bent in half along the length of the film to create a 45 -degree angle without breaking or cracking the film.

[00296] The final silk protein fragment-film is pure with undetectable levels of particulate debris and/or process contaminants, including LiBr and Na_2CO_3. Alternatively, the final SPF mixture solution has less than 500ppm process contaminants. Fig. 56 and Fig. 57 are tables summarizing LiBr and Na_2CO_3 concentrations in films (2% silk films air dried at RT) of the present disclosure. In Fig. 56, the processing conditions included 100°C extraction for 20 min, RT rinse, LiBr in 60°C oven for 4-6 hours. In Fig. 57, the processing conditions included 100°C extraction for 20 min, RT rinse, LiBr in 60°C oven for 4-6 hours.

[00297] In an embodiment, when producing a silk gel, an acid is used to help facilitate gelation. In an embodiment, when producing a silk gel that includes a neutral or a basic molecule and/or therapeutic agent, an acid can be added to facilitate gelation. In an embodiment, when producing a silk gel, increasing the pH (making the gel more basic) increases the shelf stability of the gel. In an embodiment, when producing a silk gel, increasing the pH (making the gel more basic) allows for a greater quantity of an acidic molecule to be loaded into the gel.

[00298] In an embodiment, natural additives may be added to the silk gel to further stabilize additives. For example, trace elements such as selenium or magnesium or L-methionine can be used. Further, light-block containers can be added to further increase stability.

[00299] Fig. 34 summarizes an embodiment of parameters for a silk fragment-film drying study of the present disclosure. Fig. 35 is a graph showing silk fragment-film drying times (under various air flow and temperature conditions) based on the silk fragment-film drying study of Fig. 34. These studies indicate that airflow is an important parameter to consider for drying (i.e., samples in covered containers did not dry), temperature can be altered to alter drying rate (i.e., increased temperature results in a faster rate of water removal) and that a steady-state of moisture content within the films can be obtained with a variety of parameters (i.e., from 24 to 48 hours, mass is consistent in uncovered samples regardless of temperature). Of note, the final properties of the film,

for example brittleness, will vary with drying conditions. Alternatively, film drying rate may be accelerated by the use of an additive in the SPF solution, such as a surfactant or oil. These additives may be used with or without heat to alter drying rate and final film physical properties.

[00300] In an embodiment, the drying conditions of the SPF film are 24°C in a forced air flow incubator for 12 to 48 hours depending on the number of films and ambient humidity. Under these drying conditions, a film that will not shrink more than 5 percent over time when stored in a foil pouch is created. Additionally, the film is homogeneous in composition and physical structure, with no sided-ness and an even distribution of additive, for example vitamin C, throughout.

[00301] In an embodiment, the silk protein fragment-film may stabilize vitamin C, Vitamin B, Vitamin A, and derivatives thereof at room temperature when stored in light retaining about 30% to about 100% of its activity after 30 days of storage. In an embodiment, the silk protein fragment-film may stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in light retaining about 35% to about 95%) of its activity after 30 days of storage. In an embodiment, the silk protein fragment-film may stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in light retaining about 40% to about 90% of its activity after 30 days of storage. In an embodiment, the silk protein fragment-film may-stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in light retaining about 45% to about 85% of its activity after 30 days of storage. In an embodiment, the silk protein fragment-film may stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in light retaining about 50% to about 80% of its activity after 30 days of storage. In an embodiment, the silk protein fragment-film may stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in light retaining about 55% to about 75% of its activity after 30 days of storage. In an embodiment, the silk protein fragment-film may stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in light retaining about 60% to about 70% of its activity after 30 days of storage. In an embodiment, the silk protein fragment-film may stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in a sealed airtight container or pouch that prevents light from contacting the film retaining about 80% to about 100%) of its activity after 3 to 24 months of storage. In an embodiment, the silk protein fragment-film may stabilize vitamin C, vitamin B, vitamin A, and derivatives thereof at room temperature when stored in a sealed airtight

container or pouch that prevents light from contacting the film retaining about 80% to about 100% of its activity after about 3 to about 60 months of storage. In an embodiment, the silk protein fragment-film may release between 50% to 90% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 20 mins when adhered to dampened skin. In an embodiment, the silk protein fragment-film, may release at least 50% active vitamin C, vitamin B, vitamin A, and derivatives thereof within 20 mins when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 60% active vitamin C, vitamin B, vitamin A, and derivatives thereof within 20 mins when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 70% active vitamin C, vitamin B, vitamin A, and derivatives thereof within 20 mins when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 80% active vitamin C, vitamin B, vitamin A, and derivatives thereof within 20 mins when adhered to dampened skin. In an embodiment, the silk protein fragment- film may release at least 90%) active vitamin C, vitamin B, vitamin A, and derivatives thereof within 20 mins when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release between 10% to 100% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 10% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 20% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 30% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 40% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 50% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 60% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment, the silk protein fragment-film may release at least 70% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. In an embodiment,

the silk protein fragment-film may release at least 80% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin, in an embodiment, the silk protein fragment-film may release at least 90% of active vitamin C, vitamin B, vitamin A, and derivatives thereof within 5 mins to 8 hours when adhered to dampened skin. It is believed that exposure to higher temperatures for a longer period of time may break down the silk protein into more versatile silk protein fragment mixtures and/or disrupt any silk protein tertiary and/or secondary silk protein structure that could adversely affect shelf stability and/or performance of resulting structures (e.g., moisturizing compositions (e.g. lotions), gels, films, foams, etc.) as well as reduces the number of heavy chains within the silk protein.

[00302] Figs. 36A and 36B show two HPLC chromatograms from samples comprising vitamin C, The chromatogram on the left shows peaks from (1) a chemically stabilized sample of vitamin C at ambient conditions and (2) a sample of vitamin C taken after 1 hour at ambient conditions without chemical stabilization to prevent oxidation, where degradation products are visible. The chromatogram on the right shows peaks from two different embodiments of silk films of the present disclosure that were aged for at least 30 days at room temperature. No degradation products were visible. Fig. 59 is a table summarizing the vitamin C concentration in silk protein fragment-films (2% silk films air dried at RT) of the present disclosure. In Fig. 59 processing conditions included 100°C extraction for 20 min, RT rinse, LiBr in 60°C oven for 4-6 hours, Fig. 60 is a table summarizing the stability of vitamin C in chemically stabilized solutions. Figs, 89A-89B are tables summarizing vitamin C stability in SPF gels without chemical stabilizers as compared to chemically stabilized vitamin C in competitive anti-aging skincare products. A gel cast at 20% total vitamin C additive concentration did not gel. Without wishing to be bound by theory, it appears there is a relationship between vitamin C concentration, silk concentration, and gelation. An increase in vitamin C at a given concentration of silk will result in a longer time to gelation or inhibit gelation. This may be due to the vitamin C molecule physically blocking interaction between silk protein fragments or cross-linking of silk protein.

[00303] In an embodiment, the molecule or molecules are stable and can be released over an extended time period. In an embodiment, release rate is controlled by the specific weight average molecular weight of the silk fibroin-based protein fragments used. In another embodiment, release rate is controlled by creation of a multi-layer structure. For example, multiple films can be cast and

dried upon each other. Additionally, each layer can be formed using the same or different molecular weight compositions. In an embodiment, the degree of crystallinity of the protein structure is altered through film drying conditions, thereby controlling the release rate. The molecule or molecules may be released topically on the skin, subcutaneously following implantation, or locally or systemically through oral administration or implantation. In an embodiment, the molecule or molecules is released between 1 minutes and 20 minutes. In an embodiment, the molecule or molecules is released between 20 minutes and 60 minutes, in an embodiment, the molecule or molecules is released between 1 hour and 4 hours. In an embodiment, the molecule or molecules is released between 4 hours and 8 hours. In an embodiment, the molecule or molecules is released between 8 hours and 24 hours. In an embodiment, the molecule or molecules is released between 1 day and 7 days. In an embodiment, the molecule or molecules is released between 1 week and 4 weeks. In an embodiment, the molecule or molecules is released between I month and 3 months. In an embodiment, the molecule or molecules is released between 3 months and 6 months. In an embodiment, the molecule or molecules is released between 20 minutes and 6 months. In an embodiment, the molecule or molecules are stable at extreme temperature and humidity conditions.

[00304] Films of the present disclosure comprised of about 20 kDA average weight average molecular weight silk fibroin-based protein fragments and containing about 20% vitamin C by mass, were stored individually within foil pouches and exposed to temperature extremes. Foil pouches containing films were exposed to:

[00305] -- Ambient conditions (time 0 films)

[00306] -- "Extreme Cold" (-29°C ± 2°C for 72 hours), followed by "Hot Humid" (38°C ± 2°C at 85% Humidity ± 5% for 72 hours), and subsequently "Extreme Heat, Moderate Humidity" (60°C ± 2°C at 30% Humidity ± 5% for 6 hours)

[00307] The amount of active vitamin C was measured using HPLC. All films were observed to support maintenance of vitamin C activity with exposure to extremes, as summarized in Table 17.

Table 17. Amount of active vitamin C in films under varying conditions

N	Conditions	Average Conc of vit C in sample (mg/g)	Std. Dev.
4	Time 0, ambient conditions	184.9	15.15

16	1) -29°C ± 2°C for 72 hours 193.97 10.25 2) 38°C ± 2°C at 85% Humidity ± 5% for 72 hours 3) 60°C ± 2°C at 30% Humidity ± 5% for 6 hours		

[00308] Figs. 37-45 are photographs showing silk protein fragment-films of the present disclosure dried under various temperature, time and drying conditions.

[00309] Figs. 46-54 are photographs showing the dissolution, in water, of the formed silk protein fragment-films of the present disclosure under various temperature, time and drying conditions. The water solubility of films of the present disclosure may be varied by altering drying conditions. For example, drying a film to 20% humidity in a forced air incubator and then increasing ambient humidity to 50% for a period of hours and subsequently drying the film back to 20% humidity will result in an insoluble film. Under ordinary conditions where the humidity is steadily decreased, a water-soluble silk film is created. It is anticipated that the increase in humidity allowed the protein structure to be further mobilized in the film and further crystallized, resulting in a non-soluble film. Alternative methods in the art to create non-soluble films include the introduction of methanol. The films of the present disclosure are clearly differentiated from those films due to their solubility in water. The SPF gel articles described herein range from a hydrogel which can be injected or spread topically to a film-gel article that appears as a film and contains a minimal but controlled water content, thereby preventing crystallinity and allowing water solubility.

Emulsion Stability

[00310] Emulsion stability can be determined by any of the methods known to those of ordinary skill in the art. In an embodiment, emulsion stability is determined by visual analysis of a composition of the present invention. In an embodiment, emulsion stability is determined by visual analysis of a composition of the present invention, wherein the visual analysis observes phase separation, flocculation, disproportionation, creaming, or instability of an emulsion of the present invention. In an embodiment, emulsion stability is determined by visual analysis of a composition of the present invention, wherein the visual analysis observes a change in color. In an embodiment,

emulsion stability is determined by visual analysis, wherein the visual analysis observes a change in homogeneity of a composition.

[00311] In an embodiment, emulsion stability is determined by image analysis of a composition of the present invention. In an embodiment, emulsion stability is determined by image analysis of a composition of the present invention, wherein the image analysis observes phase separation, flocculation, disproportionation, creaming, or instability of an emulsion of the present invention. In an embodiment, emulsion stability is determined by image analysis of a composition of the present invention, wherein the image analysis observes a change in color of a composition. In an embodiment, emulsion stability is determined by image analysis, wherein the image analysis observes a change in homogeneity of a composition. In any of the foregoing embodiments, the image analysis may be performed using a microscopic image analysis system. In any of the foregoing embodiments, the image analysis may perform a quantitative colorimetric measurement.

[00312] In an embodiment, emulsion stability is determined by turbidity or turbidity ratio analysis of a composition of the present invention. Turbidity and turbidity ratio measurements suitable for analysis of emulsion stability are known to those of skill in the art and are described, *e.g.*, in Frentcel, *et al.*, *J. Disp. Sci. & Tech.* **1982,** *3,* 195-207; Song, *et al.*, *J. Colloid Interface Sci.* **2000,** *230,* 213-215; and Reddy and Fogler, *J. Colloid Interface Sci.* **1981,** *79,* 101-104. Turbidity ratio methods that compare turbidity at two wavelengths (*e.g.*, 450 nm and 850 nm) may also be used to evaluate emulsion stability. In an embodiment, turbidity is measured with a turbidity meter, such as the AquaLytic AL250T-IR (infrared light), AL400T-WL (white light), or AL450T-IR, or a Hach 2100 Lab Turb. In an embodiment, turbidity is measured at 1000 nm, 900 nm, 800 nm, 700 nm, 600 nm, 500 nm, or 400 nm. In an embodiment, turbidity may be measured at an angle of 90° (using a nephelometer), with results reported in Nephelometric Turbidity Units. In an embodiment, the turbidity is measured using transmitted light, optionally after calibration with a formazine solution (reference standard) with results reported in FNUs (Formazine Nephelometric Units). In an embodiment, the turbidity of a composition of the present invention remains within 1%, 2%, 5%, 10%, 20%, 30%, 40%, or 50% of its initial value at any of the timepoints described herein.

[00313] In an embodiment, emulsion stability is determined by emulsion droplet size distribution analysis of a composition of the present invention. In an embodiment, emulsion stability is determined by emulsion droplet size distribution analysis of a composition of the present invention

using laser diffraction. In an embodiment, a stable emulsion of the present invention exhibits a stable droplet size distribution as determined by emulsion droplet size distribution analysis using laser diffraction. In an embodiment, a droplet size distribution is determined by one or more of the following statistics: d10, d50, and d90 (where d10 is the diameter at which 10% of the sample's mass is comprised of smaller diameter particles, d50 is the diameter at which 50% of the sample's mass is comprised of smaller diameter particles, and d90 is the diameter at which 90% of the sample's mass is comprised of smaller diameter particles). In an embodiment, a stable emulsion has a d10 selected from the group consisting of about 0.1 μm, about 0.5 μm, about 1 μm, about 2 μm, about 5 μm, about 10 μm, about 20 μm, about 30 μm, about 40 μm, about 50 μm, and about 100 μm. In an embodiment, a stable emulsion has a d50 selected from the group consisting of about 0.1 μm, about 0.5 μm, about 1 μm, about 2 μm, about 5 μm, about 10 μm, about 20 μm, about 30 μm, about 40 μm, about 50 μm, and about 100 μm. In an embodiment, a stable emulsion has a d90 selected from the group consisting of about 0.1 μm, about 0.5 μm, about 1 μm, about 2 μm, about 5 μm, about 10 μm, about 20 μm, about 30 μm, about 40 μm, about 50 μm, and about 100 μm. In an embodiment, a stable emulsion has a d10 range selected from the group consisting of 0.01 μm to 0.1 μm, 0.1 μm to 1 μm, 1 μm to 2 μm, 2 μm to 5 μm, 5 μm to 10 μm, 10 μm to 20 μm, 20 μm to 30 μm, 30 μm to 40 μm, 40 μm to 50 μm, 50 μm to 100 μm, and 100 μm to 200 μm. In an embodiment, a stable emulsion has a d50 range selected from the group consisting of 0.01 μm to 0.1 μm, 0.1 μm to 1 μm, 1 μm to 2 μm, 2 μm to 5 μm, 5 μm to 10 μm, 10 μm to 20 μm, 20 μm to 30 μm, 30 μm to 40 μm, 40 μm to 50 μm, 50 μm to 100 μm, and 100 μm to 200 μm. In an embodiment, a stable emulsion has a d90 range selected from the group consisting of 0.01 μm to 0.1 μm, 0.1 μm to 1 μm, 1 μm to 2 μm, 2 μm to 5 μm, 5 μm to 10 μm, 10 μm to 20 μm, 20 μm to 30 μm, 30 μm to 40 μm, 40 μm to 50 μm, 50 μm to 100 μm, and 100 μm to 200 μm. In an embodiment, the d10, d50, or d90 of a composition of the present invention remains within 1%, 2%, 5%, 10%, 20%, 30%, 40%, or 50% of its initial value at any of the timepoints described herein.

[00314] In an embodiment, emulsion stability is determined by pH measurement. In an embodiment, emulsion stability is determined by viscosity using a rotational viscometer. In an embodiment, emulsion stability is determined by oscillatory shear viscosity using a rheometer. In an embodiment, emulsion stability is determined by organoleptic analysis. In an embodiment, emulsion stability is determined by measuring specific gravity using a pycnometer. In an

embodiment, emulsion stability is determined by measuring conductivity using a conductivity meter. In an embodiment, emulsion stability of a composition of the present invention measured by any of the foregoing methods remains within 1%, 2%, 5%, 10%, 20%, 30%, 40%, or 50% of its initial value at any of the timepoints described herein.

[00315] In an embodiment, emulsion stability is determined at time points during storage at ambient temperature. In an embodiment, emulsion stability is determined after storage at 25 °C for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years. In an embodiment, emulsion stability is determined after storage at 30 °C for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years. In an embodiment, emulsion stability is determined after storage at 37 °C for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years. In an embodiment, emulsion stability is determined after storage at 45 °C for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years. In an embodiment, emulsion stability is determined after storage at 4 °C for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years. In an embodiment, emulsion stability is determined after storage at -10 °C for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years. In an embodiment, emulsion stability is determined after storage at in a cycling chamber, which cycles between 4 °C and 45 °C over 48 hours, for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3

months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years. In an embodiment, emulsion stability is determined after storage at on a shaker table, for 1 day, 2 days, 3 days, 4 days, 5 days, 6, days, 1 week, 2 weeks, 3 weeks, 1 month, 1.5 months, 2 months, 2.5 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 4 years, or 5 years.

[00316] The following examples are put forth so as to provide those of ordinary skill in the art with a complete disclosure and description of how to make and use the described embodiments, and are not intended to limit the scope of what the inventors regard as their invention nor are they intended to represent that the experiments below are all or the only experiments performed. Efforts have been made to ensure accuracy with, respect to numbers used (e.g. amounts, temperature, etc.) but some experimental errors and deviations should be accounted for. Unless indicated otherwise, parts are parts by weight, molecular weight is weight average molecular weight, temperature is in degrees Centigrade, and pressure is at or near atmospheric.

EXAMPLES

[00317] **Example 1. Development of a Silk Film of the Present Disclosure for use in Fine Line Lifting Applications**

[00318]

Table 18. Film Recipe for Fine Line Lifting Film - Fig. 82A	
% SPF Mixture Solution of the Present Disclosure	2.4%
Quantity Vitamin C	4:1 (silk:Vit C) (0.006g/mL 2.4% solution) 20%
mL per film (2.5cm by 10cm)	7.08 mL
Mass of silk per film:	170mg
Mass of l-ascorbic acid per film:	42.5mg
pH	4.0 (when water is applied)

[00319] Silk films (2.5 cm x 10 cm) were manufactured according to methods disclosed herein varying process parameters so as to result in fine line lifting films. The silk films were given the name "PureProC™ film," and can be packaged in a foil based package that is air tight and light proof. Table 18 provides details of the PureProC™ films used in a study of 32 individuals using the films for four (4) weeks. Biocompatibility and hypo-allergenicity of the films was observed. Further, no sensitization, toxicity, or immune response was observed. Fig. 84 is a graph summarizing the

quantity of vitamin C in a daily dose (i.e., the average amount of product used to cover a 25 cm^2 area of skin) of PureProC™ and competitor products over a 30 day period. Figs. 85 and 86 summarize resultant ease of use data and observed benefits within the first month of use.

[00320] In an embodiment, PureProC™ films were removed by peeling the films off. In an embodiment, PureProC™ films were removed by using a wet cotton ball or similar removal pad. In an embodiment, PureProC™ films were removed by washing the area where the film is placed with a wash cloth. In an embodiment, PureProC™ film PureProC™ films were removed using water. The PureProC™ films can be shaped into strips for multiple areas of the face or larger pieces can be cut to fit target areas. In an embodiment, grips or backing(s) on the PureProC™ films can be included for ease of application. In an embodiment, a PureProC™ film of the present disclosure includes silk and vitamin C (20%).

[00321] In an embodiment, a film of the present disclosure is soluble in water (insoluble border). In an embodiment, a film of the present disclosure is clear/transparent. In an embodiment, a film of the present disclosure has a pH=4 when water is applied. Films of the present disclosure can be made with different combinations of % silk and volume to produce films with silk quantities of 3mg/cm^2 to 10mg/cm^2. Films of the present disclosure can be made with from about 1% to about 50% 1-ascorbic acid. Films of the present disclosure can adhere to skin with water. Films of the present disclosure can be spread on skin once water is applied. Films of the present disclosure can dry when humidity of drying equipment is 16-40% and below the humidity of the lab.

[00322] **Example 2. Development of Silk Gels of the Present Disclosure**

Table 19. Gel Samples – Silk gel formulations including additives, concentration of silk and additive, gelation conditions and gelation times.

Sample Name	mL 2% silk solution	Mass Vit C (g)	Ratio Silk:Vit C	Additive	Amount of additive	Temp/treatment	Days to Gelation
1	10	0.04	5:01	None	None	RT	8
2	10	0.08	2.5:1	None	None	RT	8
3	10	0.2	1:01	None	None	RT	8
4	10	0.4	1:02	None	None	RT	14

5	10	0.8	1:04	None	None	RT	None
6	10	0.04	5:01	None	None	RT	~39
7	10	0.08	2.5:1	None	None	Fridge	~39
8	10	0.2	1:01	None	None	Fridge	~39
9	10	0.4	1:02	None	None	Fridge	None
10	10	0.8	1:04	None	None	Fridge	None
11	10	0.2	1:01	None	None	RT/Shake vigorously	8
O-1	10	0.04	5:01	None	None	37C Oven	3
O-2	10	0.04	5:01	None	None	50C Oven	2
O-3	10	0.02	1:01	None	None	37C Oven	4
O-4	10	0.02	1:01	None	None	50C Oven	3
M	40	0.16	5:01	None	None	RT	5
D	40	0.16	5:01	None	None	RT	5
E1	10	0.04	5:01	Vit E	1 drop	RT	7
E2	10	0.04	5:01	Vit E	3 drops	RT	7
E3	10	0	None	Vit E	1 drop	RT	None
E4	10	0	None	Vit E	3 drops	RT	None
L1	10	0.04	5:01	Lemon	300 uL	RT	6
L2	10	0.04	5:01	Lemon juice	300 uL	RT	6
L3	10	0.04	5:01	Lemon juice	1000 uL	RT	5
L4	10	0	0	Lemon	300 uL	RT	6
L5	10	0	0	Lemon juice	300 uL	RT	7
Jar 1	20	0.08	5:01	Lemon juice	2000 uL	RT	5-7
Jar 2	5	0.02	5:01	Lemongrass	1 drop	RT	2-3

				oil			
R-1	10	0.04	5:01	Rosemary Oil	1 drop	RT	7
T-1	10	0.04	5:01	None	None	RT/Tube	7
RO-1	10	0.04	5:01	Rose Oil	1 drop	RT	6
RO-2	10	None	None	Rose Oil	1 drop	RT	None

[00323] Ratio of Silk to Vitamin C

[00324] Samples 1-10 were used to examine the effect of silk to vitamin C ratio on serum gelation. Samples 1-3 with less vitamin C gelled quicker than samples 4 and 5. All other conditions were kept constant. Samples 6-8 with less vitamin C gelled quicker than samples 9 and 10. All other conditions were kept constant. It is concluded that decreasing the ratio of silk to vitamin C (increasing the amount of vitamin C) will lengthen the time to gel creation. At ratios with small amounts of vitamin C, days to gel creation did not vary greatly.

[00325] Physical Stimulation

[00326] Samples 3 and 11 were used to examine the effect of physical stimulation on serum gelation. Each sample was prepared under the same conditions. Sample 11 was vigorously shaken for about 3 minutes after addition of vitamin C. Treatment of 3 and 11 was otherwise the same. The shaking resulted in bubbles but did not significantly change gel creation time.

[00327] Temperature Treatment

[00328] Samples 1, 3, 6, 8, O-1, O-2, O-3, and O-4 were used to examine the effect of temperature treatment on serum gelation time. Samples 1, 6, O-1, and O-2 were identical other than temperature treatment. Samples 3, 8, O-3, and O-4 were identical other than temperature treatment. The two groups differed in silk to vitamin C ratio. Time to serum gelation was directly related to temperature treatment with a higher temperature resulting in quicker serum gelation.

[00329] Solution Volume

[00330] Samples 1, M and D were used to examine the effect of solution volume on serum gelation time. Samples M and D varied from sample 1 only by an increased solution volume. Samples M and D gelled in 5 days while sample 1 gelled in 8 days. Samples M and D were definitively noticed to be gelled on the day of gelling while sample 1 gelled over a weekend.

[00331] Additives

[00332] Samples El, E2, E3, E4, L1, L2, L3, L4, L5, Jar 2, Rl, RO-1 and RO-2 were used to examine the effect of additives on serum gelation time. Samples El-4 contained Vitamin E. Only samples El and E2 contained vitamin C and only these two samples gelled. Vitamin E can be added to a solution to become a gel but it appears that another additive may be needed to create a gel. Samples L1-5 contained a form of lemon juice. Samples L1 and L4 had juice directly from a lemon while samples L2, L3 and L5 contained lemon juice from a plastic lemon container. Samples L4 and L5 did not have vitamin C while all others did. All samples gelled showing that lemon juice can create gel on its own. Amount of lemon juice and type of lemon juice had little effect on gelation time. Sample Jar 2 contained lemon grass oil which formed an albumen like substance when initially added. This sample also had vitamin C but gelation time was significantly quicker than with other vitamin C samples. Sample Rl contained rosemary oil, which seemed to be soluble, as well as vitamin C. The sample gelled in a similar time frame to other samples with only vitamin C. Samples RO-1 and RO-2 contained rose oil while only RO-1 had vitamin C. Only RO-1 gelled showing that rose oil will not create a gel quickly on its own. In both cases the rose oil was immiscible and visible as yellow bubbles.

[00333] Aqueous silk fibroin-based fragment solution and essential oils are immiscible liquids. In an embodiment, to increase the fragrance of the silk fibroin-based fragment solution, without entrapping oils within the solution, the solution is mixed with the essential oil with the use of a stir bar. The stir bar is rotated at a speed such that some turbulence is observed in the mixture, thus causing contact between the fragrant essential oil and the molecules in solution, adding a scent to the solution. Before casting of product from the solution, mixing may be stopped and the oil allowed to separate to the top of the solution. Dispensing from the bottom fraction of the solution into the final product allows for fragrance without visible essential oil within the final product.

[00334] Alternatively, the silk fibroin-based solution and essential oil can be combined with or without additional ingredients and/or an emulsifier to create a composition containing both ingredients.

[00335] In an embodiment, mixing of the solution as described above can reduce gelation time if the solution is used to create a gel formulation.

[00336] Vessel

[00337] Samples T1 and Jar 1 were used to examine the effect of casting vessel on serum gelation time. Jar 1 was cast in a glass jar while T1 was cast in an aluminum tube. Both samples gelled and did not affect serum gel time.

[00338] Summary

[00339] All treatments of silk solution for gel solution were in a conical tube at room temperature unless otherwise stated. The ratio of silk to vitamin C did affect the ability of a solution to gel as ratios above 1:2 did not gel and a 1:2 ratio took twice as long as other lower ratios (5:1 , 2.5:1 , 1:1). Temperature affected gel creation time with higher temperatures resulting in quicker gel times. 50°C treatment gelled in as quick as 2 days, 37°C treatment gelled in as quick as 3 days, room temperature treatment gelled in 5-8 days and storage in a refrigerator took at least 39 days to gel. The effects of additives on gel creation were dependent on the additive. Vitamin E, Rosemary Oil and Rose Oil all had no effect on gel creation. Each of these additives did not prevent gelation or affect the time to gelation. Each also required the presence of vitamin C to gel. Lemon juice from a fresh lemon, pre-squeezed lemon juice from a plastic lemon container and lemon grass oil did affect gel creation. Without wishing to be bound by theory, it is believed that the lower pH as a result of these additives is the reason the additives had an impact on decreasing gelation time. Both lemon juice types were able to cause gelation without the presence of vitamin C. This occurred in the same number of days as with vitamin C. The lemongrass oil was able to decrease the number of days to gelation to 2-3 days. Ail additives appeared soluble other than lemongrass oil and rose oil. Rose oil remained in yellow bubbles while the lemongrass oil was partially soluble and formed an albumen like chunk. In an embodiment, oils that are not fully soluble can still be suspended within the gel as an additive. Physical stimulation by shaking, vessel the solution was cast into and solution volume did not affect gelation time. Fig. 81 is a graph representing the % Activity of Vitamin C in gels of the present disclosure.

[00340]

Table 20. Concentration of vitamin C in various gel formulations			
Sample Info	Sample Weight	Concentration of Vitamin C (mg/g)	
	(mg)	In Sample	Average
Rosemary (Room Temperature storage)	685.7	3.2511	3.2657
		3.2804	
	638	3.3336	3.3334
		3.3332	
Lemongrass (Room Temperature storage)	646	2.8672	2.877
		2.8868	
	645.5	2.9051	2.9052
		2.9052	
Rosemary (Room Temperature; Foil Covered storage)	645.2	3.9063	3.9147
		3.923	
	649	3.9443	3.9374
		3.9305	
Lemongrass (Room Temperature; Foil	630.1	3.9443	3.9374
		3.9305	

Covered storage)	660.4	3.8253	3.8274
		3.8295	
Rosemary (Fridge, Foil Covered storage)	672.4	5.1616	5.1484
		5.1352	
	616.5	5.1984	5.201
		5.2036	
Lemongrass (Fridge, Foil Covered storage)	640.5	5.1871	5.1824
		5.1776	
	627.7	5.2098	5.2126
		5.2154	

[00341] **Example 3. Development of Silk Gels of the Present Disclosure for use as Smoothing**

[00342]

Table 21. Lemongrass Gel	
% Silk Solution	2%
Quantity Vitamin C	100mg/15mL solution
Quantity Lemongrass Oil	20uL/15mL solution

Table 22. Rosemary Gel	
% Silk Solution	2%
Quantity Vitamin C	100mg/15mL solution
Quantity Rosemary Oil	20uL/50mL solution

Table 23. Lemongrass Gel (50 mL)	
% Silk Solution (60 minute boil, 25kDA)	2%
Quantity Vitamin C (ascorbyl glucoside)	12.82 mg/mL solution (641mg total)
Quantity Lemongrass Oil	1.33uL/mL solution
pH	4

[00343]

Table 24. Rosemary Gel (50 mL)	
% Silk Solution (60 minute boil, 25kDA)	2%
Quantity Vitamin C (ascorbyl glucoside)	12.82 mg/mL solution (641mg total)
Quantity Rosemary Oil	0.8uL/mL solution
pH	4

[00344] Gels of the present disclosure can be made with about 0.5% to about 8% silk solutions. Gels of the present disclosure can be made with ascorbyl glucoside at concentrations of about 0.67% to about 15% w/v. Gels of the present disclosure be clear/white in color. Gels of the present disclosure can have a consistency that is easily spread and absorbed by the skin. Gels of the present

disclosure can produce no visual residue or oily feel after application. Gels of the present disclosure do not brown over time.

[00345] Silk gels with essential oils were prepared by diluting a silk solution of the present disclosure to 2%. Vitamin C was added to the solution and allowed to dissolve. The essential oil was added, stirred and dissolved. The solution was aliquot into jars.

[00346] A trial was conducted with 44 people on two formulations of the present disclosure, PureProC™ Rosemary Gel and PureProC™ Lemongrass Gel (Figs. 87 and 88). Respondents were asked to use each sample once a day for a week each. The majority of respondents applied the gel to the whole face. Other areas where it was most commonly applied included the forehead, under eyes and near mouth.

[00347] The majority of respondents applied the gel during the morning (67%) with the balance 33% applying the gel in the evening. Ninety-eight (98%) of participants used the gel once a day during the test. Respondents were asked to describe in their own words how the gel felt when it was applied and how it felt during the 24 hours until the next application. Smooth, cool, and soft were the most often mentioned adjectives used to describe how the gel felt. Eighty percent (80%) of test participants gave a high score to interest in continuing to use the gel.

[00348] Respondents were asked about what they did with their other products that were usually used on their face during the trial. The majority applied the gel first and then added the other products or applied the gel at night with no additional products. Only 14% of participants indicated that they eliminated one of their normal products while testing the gel. PureProC™ can be used in conjunction with or in replacement of other products. Additionally, sunscreen can be added to the gel or it may be dispensed from a pump instead of a jar. With repeated topical use, no skin irritation, rash, or signs of non-compatibility was observed. Biocompatibility and hypo-allergenicity of the gels was observed. Further, no sensitization, toxicity, or immune response was observed.

[00350] **Example 4. Silk Articles of the Present Disclosure Made From Silk Solutions of the Present Disclosure**

[00351] Silk solutions of various molecular weights and/or combinations of molecular weights can be optimized for specific applications. The following provides an example of this process but it not intended to be limiting in application or formulation.

[00352] Three (3) silk solutions were utilized in standard silk structures in accordance with standard methods in the literature with the following results:

[00353] • Solution #1 is a silk concentration of 5.9%, average MW of 19.8 kDa and 2.2 PD (made with a 60 min boil extraction, 100 degree LiBr dissolution for 1 hr)

[00354] • Solution #2 is a silk concentration of 6.4% (made with a 30 min boil extraction, 60 degree I.iBr dissolution for 4 hrs)

[00355] • Solution #3 is a silk concentration of 6.17% (made with a 30 min boil extraction, 100C LiBr dissolution for 1 hour)

[00356] Films: Films were made in accordance with Rockwood et al (Nature Protocols; Vol. 6; No. 10; published on-line 9/22/2011; doi: 10.1038/nprot.2011.379). Briefly, 4mL of 1% or 2% (wt/vol) aqueous silk solution was added into 100mm Petri dish (Volume of silk can be varied for thicker or thinner films and is not critical) and allowed to dry overnight uncovered. The bottom of a vacuum desiccator was filled with water. Dry films were placed in the desiccator and vacuum applied, allowing the films to water anneal for 4 hours prior to removal from the dish. Films cast from solution #1 did not result in a structurally continuous film; the film was cracked in several pieces. These pieces of film dissolved in water in spite of the water annealing treatment.

[00357] Egel: "Egel" is an electro gelation process as described in Rockwood et al. Briefly, 10 ml of aqueous silk solution is added to a 50 ml conical tube and a pair of platinum wire electrodes immersed into the silk solution. A 20 volt potential was applied to the platinum electrodes for 5 minutes, the power supply turned off and the gel collected. Solution #1 did not form an EGEL over the 5 minutes of applied electric current.

[00358] Gelation: Solutions #2 and #3 were gelled in accordance with the published horseradish peroxidase (HRP) protocol. Behavior seemed typical of published solutions.

[00359] Sonicated Gels: Gels were made following the sonication process in Rockwood et al.

[00360] Briefly, 5 ml of silk solution was added to a 15 ml conical tube. The sonicating horn was immersed in the solution and the solution sonicated at 50% amplitude (21W). Silk gels were made with 2%, 4% and 6% silk solutions. As compared to standard literature silk, Solutions #2 and #3 formed gels after a longer time, for example:

[00361] • Standard literature silk: 5-8 min

[00362] • Solution #2; 20 min

[00363] • Solution #3: 120 min

[00364] Porous 3D scaffolds: Water based, salt leached scaffolds were made in accordance with the published methods of Rockwood. Salt with particle sizes of interest was prepared by stacking the sieves with the largest mesh on top and the smallest mesh on the bottom. Salt was added and sieves shaken vigorously collecting the salt. With a 5 ml syringe, 6% (wt/vol) fibroin solution was aliquoted into plastic containers, 2 ml per mold and 5-600 micron salt particles were slowly added on top of the fibroin solution in the mold while rotating the container so that the salt was uniform. The ratio of salt to silk in solution was maintained at 25:1

[00365] The container was gently tapped on the bench to remove air bubbles, the cap closed and the solution allowed to settle overnight at room temperature. Once gelled, the lids were removed and the molds placed in a 2-liter beaker with ultrapure water (three containers per 2 liters of water). The beakers were transferred to a stir plate and stirred, changing the water 2-3 times per day for 2 d (4-5 washes in total). The scaffolds were removed from the molds and placed them in fresh water for an additional day.

[00366] Solution #1 did not form a scaffold; it did not gel. Both solution # 2 & #3 formed scaffolds. The scaffolds made with Solution #3 appear softer than the ones made with Solution #2, but both scaffolds were homogeneous.

[00367] **Example 5. Tangential Flow Filtration (TFF) to Remove Solvent from Dissolved Silk Solutions of the Present Disclosure**

[00368] A variety of % silk concentrations have been produced through the use of Tangential Flow Filtration (TFF). In all cases a 1 % silk solution was used as the input feed. A range of 750-18,000mL of 1% silk solution was used as the starting volume. Solution is diafiltered in the TFF to remove lithium bromide. Once below a specified level of residual LiBr, solution undergoes ultrafiltration to increase the concentration through removal of water. See examples below.

[00369] 7.30% Silk Solution: A 7.30% silk solution was produced beginning with 30 minute extraction batches of 100g silk cocoons per batch. Extracted silk fibers were then dissolved using 100C 9.3M LiBr in a 100C oven for 1 hour. 100g of silk fibers were dissolved per batch to create 20% silk in LiBr. Dissolved silk in LiBr was then diluted to 1 % silk and filtered through a 5 um filter to remove large debris. 15,500 mL of 1%, filtered silk solution was used as the starting volume/diafiltration volume for TFF. Once LiBr was removed, the solution was ultrafiltered to a volume around 1300mL. 1262mL of 7.30% silk was then collected. Water was added to the feed to help remove the remaining solution and 547mL of 3.91% silk was then collected.

[00370] 6.44% Silk Solution: A 6,44% silk solution was produced beginning with 60 minute extraction batches of a mix of 25, 33, 50, 75 and 100g silk cocoons per batch. Extracted silk fibers were then dissolved using 100C 9.3M LiBr in a 100C oven for 1 hour, 35, 42, 50 and 71g per batch of silk fibers were dissolved to create 20% silk in LiBr and combined. Dissolved silk in LiBr was then diluted to 1% silk and filtered through a 5 um filter to remove large debris. 17,000 mL of 1%, filtered silk solution was used as the starting volume/diafiltration volume for TFF. Once LiBr was removed, the solution was ultrafiltered to a volume around 3000mL. 1490mL of 6.44% silk was then collected. Water was added to the feed to help remove the remaining solution and 1454mL of 4.88%) silk was then collected

[00371] 2.70% Silk Solution: A 2.70% silk solution was produced beginning with 60 minute extraction batches of 25g silk cocoons per batch. Extracted silk fibers were then dissolved using 100C 9.3M LiBr in a 100C oven for 1 hour. 35.48g of silk fibers were dissolved per batch to create 20% silk in LiBr. Dissolved silk in LiBr was then diluted to 1% silk and filtered through a 5 um filter to remove large debris. 1000 mL of 1%, filtered silk solution was used as the starting volume/diafiltration volume for TFF. Once LiBr was removed, the solution was ultrafiltered to a volume around 300mL. 312mL of 2.7% silk was then collected.

[00372] **Example 6. Gel Vitamin C Derivatives of the Present Disclosure**

[00373] The purest form of vitamin C is L -ascorbic acid. There are a number of other derivatives of vitamin C that function like pure vitamin C after they are converted to L-ascorbic acid in the body. Vitamin C derivatives are being utilized to extend shelf life. Derivatives are stable forms of L-ascorbic acid and will not oxidize or lose stability. Table 25 below summarizes some vitamin C derivatives tested in the skin care products of the present disclosure:

Table 25. Derivatives Explored
Sodium Ascorbyl Phosphate (Aromantic)
Sodium Ascorbyl Phosphate (DSM)
Magnesium Ascorbyl Phosphate
Ascorbic Acid-2-Glucoside
Ascorbyl Tetraisopalmitate

[00374] The Tables in Figs. 89A-89B summarize embodiments of gels of the present disclosure. Ascorbic acid-2-glucoside was the most successful vitamin C derivative at gel formation with gel being formed in a 2% silk solution in 3 days. Sodium ascorbyl phosphate from DSM supplier formed a gel in a 2% silk solution after 28 days while the same molecule from Aromantic failed to create a gel. In all cases 100 mg of vitamin C derivative was mixed in 15 mL of 2% silk solution, and all gels had the same appearance as gels created with ascorbic acid.

[00375] Gels were also cast with combinations of two vitamin C options. In each case, at least one of the vitamin C options was known to cause gelation (L-ascorbic acid or ascorbic acid-2-glucoside). All combination gels were able to gel at 1% total vitamin C additive concentration. A gel cast at 20% total vitamin C additive concentration did not gel. Without wishing to be bound by theory, it appears there is a relationship between vitamin C concentration, silk concentration, and gelation. An increase in vitamin C at a given concentration of silk will result in a longer time to gelation or inhibit gelation. This may be due to the vitamin C molecule physically blocking interaction between silk protein fragments or cross-linking of silk protein. Modification to pH may allow additional concentrations of vitamin C and derivatives thereof to be added.

[00376] Ascorbyl tetraisopalmitate was not used in any gel forming formulation, as it was unable to dissolve or be dispersed in an aqueous silk solution. Ascorbyl tetraisopalmitate is a highly viscous, oil soluble liquid that might need the help of an emulsifier to possible dissolve in aqueous silk solution.

[00377] **Example 7. Film Vitamin C Derivatives of the Present Disclosure**

[00378] Fig. 90 is a table summarizing embodiments of films of the present disclosure. Sodium ascorbyl phosphate, magnesium ascorbyl phosphate and ascorbic acid-2-glucoside could be cast in films with varying appearance. Sodium ascorbyl phosphate films were opaque and white with a

textured top surface similar to plastic. Magnesium ascorbyl phosphate films were clear and cloudy with a textured top surface similar to plastic. Ascorbic acid-2-glucoside films were most similar to L-ascorbic acid films although slightly less pliable and slightly textured. All films were soluble with an insoluble border. In an embodiment, a film with an insoluble border can be made completely spreadable by punching a shape from the region contained within the soluble section.

[00379] **Example 8. Caffeine Films with Vitamin C of the Present Disclosure**

[00380] Figs. 91A-91B are fables summarizing embodiments of caffeine films of the present disclosure. Films were cast with 0.5%, 1%, 2.5%, 5%, 10%, 15% and 20% caffeine and 20% or 25% vitamin C. All combinations formed films. 20% caffeine films had caffeine precipitate out. Films with 0.5%-2.5% were soluble. In an embodiment, a caffeine film of the present disclosure is used for reducing puffy eyes.

[00381] **Example 9. Caffeine Gels with Vitamin C of the Present Disclosure**

[00382] A silk gel with 2 % silk and 100mg L-ascorbic acid/ 15 mL solution was created with the addition of 50 mg caffeine/15mL solution. The gel has the exact appearance of standard L-ascorbic acid gels. In an embodiment, a caffeine gel of the present disclosure is used for reducing puffy eyes. A range of essential oils can be used including, but not limited to, lemongrass, vanilla, geranium, and green tea.

[00383] **Example 10. Green Tea Gels with Vitamin C of the Present Disclosure**

Steps	
Green Tea Prep	Heat 250 mL water to boil. Steep tea bag 2-3 minutes with occasional stir. Remove tea bag and let cool.
Gel Solution Prep	Use TFF-10-0047 (3.71% silk) dilute to 3% silk with water; dilute to 2% with green tea; add L-ascorbic acid.
Gel	Gelation occurred like standard gel at room temperature. Green/yellow color. Green Tea scent.
Solution Spec.	2% silk solution. 65 mL (35 ml of 3.71% silk,

	8.3mL water, 21.66mL green tea); 0.43 g L-ascorbic acid

[00384] Fig. 92 is a table summarizing an embodiment of a caffeine gel of the present disclosure. A silk gel with 2% silk and 100mg L-ascorbic acid/15 mL solution was created with the addition of 50 mg caffeine/15mL solution. The gel has the exact appearance of standard L-ascorbic acid gels.

[00385] **Example 11. Preservative Gels with Vitamin C of the Present Disclosure**

[00386] Fig. 93 is a table summarizing embodiments of preservative gels of the present disclosure. Silk gels were cast with standard 2% silk solution and 100mg L-ascorbic acid/ 15 mL solution with the addition of a preservative and chelating agent. The preservative added was Verstatil SL by Kinetic (Water, Sodium Levulinate, Potassium Sorbate) at 1.5% and the chelating agent was Dermofeel-PA3 by Kinetic (Sodium Phytate) at 0.1%. The addition of preservatives extended gelation time to 7 days. Gel is being observed for discoloration and integrity with L-ascorbic acid and ascorbic acid-2-glucoside gel comparisons.

[00387] **Example 12. Chemical Peels of the Present Disclosure**

[00388] The primary variable investigated was the concentration of lactic acid and/or glycolic acid necessary to create a silk solution of a desired pH. In order to determine the relationship between concentration in silk and pH, 2% silk solutions (60 minute boil, 25kDA) were titrated with glycolic and lactic acid and tested for pH with pH strips. See the following titrations/formulations below:

Table 26. Lactic Acid Peel 1: Initial solution: 25mL of 2% silk solution, pH=7-8		
Quantity of Lactic Acid Added	Total Lactic Acid	pH
100μL	100μL	3
100μL	200μL	2
100μL	300μL	1-2

Time to gel: 3 days

Table 27. Lactic Acid Peel 2: Initial solution: 25mL of 2% silk solution, pH=7-8		
Quantity of Lactic Acid Added	Total Lactic Acid	pH
25μL	25μL	4

Time to gel: >5 days

Table 28. Glycolic Acid Peel 1: Initial solution: 25mL of 2% silk solution, pH=7-8		
Quantity of Glycolic Acid Added	Total Glycolic Acid	pH
41mg	41 mg	4
43.25mg	84.25mg	3
30.7mg	114.95mg	3
56.4 mg	171.35 mg	2-3
91.66 mg	263.01mg	2
171.35mg	434.4mg	1-2

[00389]

[00390] Time to gel: 3 days

Table 29. Glycolic Acid Peel 2: Initial solution: 25mL of 2% silk solution, pH=7-8		
Quantity of Lactic Acid Added	Total Lactic Acid	pH
41 mg	41 mg	4

[00391] Time to gel: >5 days

Table 30. Lactic/Glycolic Acid Peel: Initial solution: 25mL of 2% silk solution, pH=7-8			
Total Lactic Acid	Total Glycolic Acid	Lemongrass	pH
150μL	200mg	33.3μL	2

[00392]

[00393] Time to gel: 3 days

[00394]

Table 31. Lactic/Glycolic Acid Peel: Initial solution: 30mL of 2% silk solution, pH=7-8	
% Silk Solution (60 minute boil, 25kDA)	2%
Lactic Acid Concentration	6μL/mL
Glycolic Acid Concentration	8mg/mL
pH	2
Lemongrass Concentration	1.33 μL/mL

[00395] A peel of the present disclosure can have a % silk ranging from about 0.5% to about 8%. The pH of a peel of the present disclosure can be adjusted with varying quantities of lactic and glycolic acid. Peels can also be made with lactic acid only or glycolic acid only, A peel of the present disclosure can be clear/white in color. A peel of the present disclosure can have a gel consistency that is easily spread and absorbed by the skin. A peel of the present disclosure does not brown or change colors.

[00396] In an embodiment, a chemical peel of the present disclosure can be applied weekly to reveal healthy, vibrant skin. In an embodiment, a chemical peel of the present disclosure can be applied weekly to diminish fine lines. In an embodiment, a chemical peel of the present disclosure can be applied weekly to firm the skin.

[00397] Each formulation (after titration, if applicable) was applied as a liquid and as a gel and observed for look and feel. Peels of pH=4 (Lactic Acid Peel 2, Glycolic Acid peel 2) resulted in a minimal burning feeling after a few minutes of application, while peels of pH= ~2 (Lactic Acid Peel 1 , Glycolic Acid Peel 1 , Lactic/Glycolic Acid Peel) caused a slightly more intense burning feel. Little difference in degree of burning was felt between liquid and gel other than that the burning sensation was more delayed in the gel form. PH was maintained in the gel form and was confirmed by using a pH strip.

[00398] Glycolic acid and lactic acid are both alpha hydroxy acids (AHAs) that are among the most commonly used peels for superficial peeling (outermost skin layer peeling). Chemical peels are intended to burn the top layers of the skin in a controlled manner, to remove superficial dermal layers and dead skin in order to improve appearance. AHAs are common in chemical peels due to low risk of adverse reactions and high control of strength (control pH and time applied). Glycolic acid is most commonly used and has a very small molecular size, enabling deep penetration into the epidermis. Lactic acid is another commonly used AHA and offers a more gentle peel with higher control due to its larger molecular size. Any number of chemicals known in the art that lower pH and are physical exfoliates can be used in place of AHAs.

[00399] **Example 13. Hydrating Serums of the Present Disclosure**

[00400] Variables include: concentration of silk in solution, concentration of HA, addition

[00401] 15 of vitamin C, and serum preparation method. Table 32 is a list of samples that were evaluated:

Table 32. Embodiments of serums of the present disclosure containing HA and Silk (60 minute boil, 25kDA), with or without vitamin C, and with 20μL/15mL lemongrass essential oil (30 mL solution)

Method	HA (%)	Silk (%)	Vit C (mg)	Observation
HA added to water before dilution of silk	0.5	2	0	White, slightly opaque, viscous liquid
	1			White/yellow, slightly opaque, viscous liquid
	0.5	2	0	Low viscosity, clear-white opaque with film on top, some white residue when applied topically to skin
	1			Slightly viscous, clear liquid with film on top
	0.5	1	0	Slightly viscous, clear liquid with film on top
	1			Smooth viscous liquid, no white residue when applied topically to skin
	0.5	0.5	0	Moderately viscous liquid, clear
	1			Smooth, clear, no white residue when applied topically to skin
	0.5	2	35	Non homogeneous mix of hard gel and viscous liquid
	1			Non homogeneous mix of hard gel and viscous liquid
	1	1	35	Non homogeneous mix of hard gel and viscous liquid
		0.5		Opaque, white liquid/non-viscous

	1	4	35	Separated mixture of hard gel and viscous liquid
			0	Non homogeneous mix of hard gel and viscous liquid
	5	2	0	Yellow, gel
HA added to water before dilution of silk, stirred vigorously	10	2	0	Viscous jelly upon stirring with undissolved HA
	5			Very viscous jelly upon stirring
	1			Viscous jelly upon stirring
	0.5			
HA added to water before dilution of silk, shaken	1	2	0	Non homogeneous thick, viscous jelly/gel
	5	1	0	
HA added to water and let sit for 1 day before dilution of silk	1	1	0	Clear/slightly opaque, viscous liquid, smooth feel, little to no white residue when applied topically to skin
HA added to diluted silk solution, stirred	0.5	2	0	Viscous, clear/white liquid varying in consistency
	1			
	0.5	1		Clear viscous liquid varying in consistency
	1			
	0.5	6		White, opaque jelly varying in consistency
	1			
HA added to diluted silk solution,	0.5	3.9	0	White, slightly opaque, viscous liquid
	1			
	0.5	2	35	White gel varying in consistency

stirred	1			

[00402] In an embodiment, a hydrating serum of the present disclosure protects the skin and seals in moisture with the power of silk fibroin-based fragment proteins. In an embodiment, a hydrating serum of the present disclosure delivers moisture for immediate and long-term hydration throughout the day with concentrated hyaluronic acid. A range of essential oils can be used in a hydrating serum of the present disclosure including, but not limited to, lemongrass, vanilla, geranium, and green tea. In an embodiment, one or two drops of a hydrating serum of the present disclosure can be smoothed over the face and neck. In an embodiment, a hydrating serum of the present disclosure includes water, aqueous silk fibroin-based fragment solution, hyaluronic acid, and lemongrass oil. In an embodiment, the silk fibroin-based fragment protein in a hydrating serum of the present disclosure has the ability to stabilize and protect skin while sealing in moisture, ail without the use of harsh chemical preservatives or synthetic additives. In an embodiment, the hyaluronic acid in a hydrating serum of the present disclosure nourishes skin and delivers moisture for lasting hydration. In an embodiment, the lemongrass essential oil in a hydrating serum of the present disclosure yields antioxidant and ant -inflammatory properties that support skin rejuvenation. In an embodiment, a hydrating serum of the present disclosure has a pH of about 6.0.

[00403] Silk Fibroin-based Fragment Solution

[00404] Because silk fibroin-based fragment solution is both aqueous and able to entrap and deliver small molecules, the solution is able to deliver both water and hygroscopic HA molecules to the skin for hydration. A range in concentration of silk fibroin-based fragment compositions in solution from 0.5%-6.0% was tested for feasibility and product outcome. All concentrations tested were found to be feasible.

[00405] Hyaluronic Acid

[00406] Hyaluronic acid (Sodium Hyaluronate) was tested as an ingredient in the hydrating serum due to its hygroscopic properties and ability to promote soft, hydrated skin. A range in concentration of hyaluronic acid in solution from 0.5%- 10.0% was tested for feasibility and product outcome. All concentrations tested, with the exception of 10.0%), were found to be feasible. Feasibility was determined based on the ability to dissolve hyaluronic acid.

[00407] Vitamin E and Derivatives Thereof

[00408] Vitamin C (L-ascorbic acid) was tested as an ingredient in the hydrating serum. Initial vitamin C samples became a non-homogeneous mixture of gel and liquid. A follow-up trial with vitamin C resulted in a homogeneous, white, opaque, non-viscous liquid that was not quickly absorbed by the skin, in an embodiment, a vitamin C derivative that does not readily cause gelation, such as sodium ascorbyl phosphate, could be added up to the concentration at which it would no longer be soluble (for example, 0% to about 40%). In an embodiment, 20% sodium ascorbyl phosphate could be added. Vitamin C options that do cause gelation (L-ascorbic acid and ascorbyl glucoside) could be added at high concentrations (for example greater than about 10% up to about 50%) at which gelation is inhibited.

[00409] Serum Creation Method

[00410] Initial serums were created by the addition of HA to a silk fibroin-based fragment solution followed by stirring. The HA appeared to stick together and was not dissolved until forcefully stirred. The mixing process was then changed so that HA was first dissolved in water and then immediately used to dilute a high concentration silk fibroin- based fragment solution (>4%) to the desired concentrations. The resulting serums were more homogeneous and had a desirable smooth, clear look and feel. Upon application to the skin, a white residue briefly appeared that could be rubbed in. In an alternate method formulations were created by dissolving HA in water and allowing it to sit for 1 day until complete dissolution was observed. The HA and water solution was then used to dilute a high concentration silk fibroin-based fragment solution to the desired concentrations. The resulting serum was clear, smooth, homogeneous and left little to no white residue when applied.

[00411] **Example 14. UV Hydrating Serums of the Present Disclosure**

[00412] Variables tested include: concentration of HA, concentration of zinc oxide, concentration of titanium dioxide, addition of vitamin C, and serum preparation method.

[00413] Figs. 94A-94C are tables summarizing embodiments of cosmetic serums of the present disclosure with varying additives and concentrations of components suitable for protection against ultraviolet radiation (UV). Table 33 provides an embodiment of a hydrating serum of the present disclosure with vitamin C.

[00414]

Table 33. Embodiment of Hydrating serum of the present disclosure with vitamin C	
% Silk Solution (60 minute boil, 25kDA)	1.0% w/v
Hyaluronic Acid (sodium hyaluronate)	0.75% w/v
Lemongrass Oil	20uL/15mL silk solution
Sodium Ascorbyl Phosphate	6g
Lactic Acid	1.2 mL

[00415] A serum of the present disclosure can be made with from about 0.25% to about 10% sodium hyaluronate (increasing % results in more viscous serum). 0.5% to about

[00416] 10% silk solutions can be used to prepare a serum of the present disclosure. A serum of the present disclosure can be clear and have a yellow tinted color, A. serum of the present disclosure can have a pH=6. A serum of the present disclosure can have a lubricious texture that is rubbed in easily without residue,

[00417] Concentration of HA

[00418] Hyaluronic acid (Sodium Hyaluronate) was tested as an ingredient in the UV silk serum due to its hygroscopic properties and widely accepted use in cosmetic products to promote hydration of skin. 1%, 2.5% and 5% HA solutions were tested. With increasing HA %, the serum became more viscous and gel like. 1% HA was not feasible for the UV serum due to the fact that the UV additives (zinc oxide, titanium dioxide) are not water soluble and need to be dispersed. 1 % HA was not viscous enough for dispersion and the UV additives precipitated out, 2.5% gave the best consistency based on preferred feel, texture and viscosity and was able to disperse the UV additives, 5% was a very thick, viscous serum.

[00419] Concentration of Mineral Filters: Zinc Oxide and Titanium Dioxide:

[00420] Zinc oxide and titanium dioxide were explored as UV additives that are considered safe. These additives mechanically protect from U radiation by forming a physical reflective barrier on the skin. Both are not soluble in water and must be dispersed for the current aqueous solution. Zinc oxide concentration varied from 2.5%, 3.75%, 5%), 5.625%), 10%, 12% and 15%. Titanium dioxide concentrations varied from 1.25%, 1.875%), 3%, 5% and 10%), increasing the concentration of UV additives resulted in minor increases of white residue and how well dispersed the additives were, however if mixed well enough the effects were negligible. Zinc oxide and titanium dioxide were mixed together into serums in order to achieve broad spectrum protection. Zinc oxide is a broad spectrum UV additive capable of protecting against long and short. UV A and UV B rays. However titanium dioxide is better at UV B protection and often added with zinc oxides for best broad

spectrum protection. Combinations included 3.75%/1.25% ZnO/TiO_2, 5.625%/1.875% ZnO/TiO_2, 12%/3% ZnO/TiO_2, 15%/5% ZnO/TiO_2. The 3.75%/1.25% ZnO/TiO_2 resulted in spf 5 and the 5.625%/1.875% ZnO/TiO_2 produced spf 8.

[00421] Vitamin C:

[00422] Sodium ascorbyl phosphate was used as a vitamin C source. Formulations were created with the vitamin C concentration equal to that in the silk gel (0.67%). Formulations were also created with 20% sodium ascorbyl phosphate which is soluble in water.

[00423] Serum Preparation:

[00424] The vitamin C (sodium ascorbyl phosphate) must first be dissolved in water. Sodium hyaluronate is then added to the water, mixed vigorously and left to fully dissolve. The result is a viscous liquid (depending on HA %). The viscosity of the HA solution al lows even dispersion of the zinc oxide and titanium dioxide and therefore HA must be mixed before addition of UV additives. The zinc oxide and titanium dioxide are then added to the solution and mixed vigorously with the use of an electric blender. Silk solution is then added and mixed to complete the serum formulation.

[00425] Chemical Filters:

[00426] A UV serum of the present disclosure can include one, or a combination of two or more, of these active chemical filter ingredients: oxybenzone, avobenzone, octisalate, octocrylene, homosalate and octinoxate. A UV serum of the present disclosure can also include a combination of zinc oxide with chemical filters.

[00427] In an embodiment, a UV serum of the present disclosure can be applied approximately 15 minutes before sun exposure to all skin exposed to sun, and can be reapplied at least every 2 hours. In an embodiment, a UV serum of the present disclosure includes water, zinc oxide, sodium hyaluronate, titanium dioxide, silk, and vitamin C or a vitamin C derivative such as sodium ascorbyl phosphate, in an embodiment, a UV serum of the present disclosure protects skin and seals in moisture with the power of silk protein. In an embodiment, a UV serum of the present disclosure improves skin tone, promotes collagen production and diminishes the appearance of wrinkles and fine lines with the antioxidant abilities of vitamin C. In an embodiment, a UV serum of the present disclosure delivers moisture for immediate and long-term hydration throughout the day with concentrated hyaluronic acid. In an embodiment, a UV serum of the present disclosure helps prevent

sunburn with the combined action of zinc oxide and titanium dioxide. In an embodiment, a UV serum of the present disclosure is designed to protect, hydrate, and diminish fine lines while shielding skin from harsh UVA and UVB rays. In an embodiment, the silk protein in a UV serum of the present disclosure stabilizes and protects skin while sealing in moisture, without the use of harsh chemical preservatives or synthetic additives. In an embodiment, the vitamin C/derivative in a UV serum of the present disclosure acts as a powerful antioxidant that supports skin rejuvenation. In an embodiment, the sodium hyaluronate in a UV serum of the present disclosure nourishes the skin and delivers moisture for long-lasting hydration. In an embodiment, the zinc oxide and titanium dioxide in a UV serum of the present disclosure shields skin from harmful UVA and UVB rays. The silk protein stabilization matrix in a UV serum of the present disclosure protects the active ingredients from the air, to deliver their foil benefits without the use of harsh chemicals or preservatives. The silk matrix also traps moisture within the skin furthering the hydrating effect of the sodium hyaluronate.

[00428] **Example 15. Dark Spot Films of the Present Disclosure**

[00429] To reduce the appearance of dark spots, a high concentration of vitamin C may be necessary to reverse the overproduction of melanin. In this example, a 40% vitamin C (1.5: 1 silk to vitamin C) was studied. The size and shape of the film can be made appropriate to a targeted area, for example to a small circular film of diameter 1 in (2.54cm).

[00430] The dark spot film, or a similar film of the present disclosure, of varying vitamin C concentration (0-50%) can be applied as a hydrofilm. Skin can be wetted with water. The film is then applied to the wet area. Water is then applied to the top surface of the film to turn it into a gel. The gel can then be spread and gently massaged into the application area. Table 34 provides details of an embodiment of a hydrofilm of the present disclosure (with no insoluble border).

[00431]

Table 34. An Embodiment of a hydrofilm of the present disclosure	
% Silk Solution (60 minute boil, 25kDA)	2.56%
Quantity Vitamin C (l-ascorbic acid)	15.62 mg total (10 mg in 1in circle punch out)
Volume of solution per mold	2.44 mL
Film Size	1.25 in diameter circle (7.917cm^2)

[00432] A film of the present disclosure can be made with different combinations of % silk and volume to produce films with silk quantities of 3mg/cm^2 to 10mg/cm^2. A film of the present

disclosure can be made with from about 1 % to about 50% l-ascorbic acid. A film of the present disclosure is soluble in water (insoluble border is removed by punching out the center of the film). A film of the present disclosure can adhere to skin with water. A film of the present disclosure can be spread on skin once water is applied. A. film of the present disclosure can be dried when the humidity of drying equipment is 16-40%) and below the humidity of the lab. A film of the present disclosure can be clear/transparent.

[00433] In an embodiment, a dark spot film of the present disclosure includes water, silk, and vitamin C (L-ascorbic acid). In an embodiment, a dark spot film of the present disclosure includes 40% vitamin C, In an embodiment, a dark spot film of the present disclosure reduces skin pigmentation and evens skin tone in a targeted area with daily- use. Vitamin C can inhibit pigment transfer from pigment producing cells, called melanocytes, to skin surface cells with continual application. In an embodiment, a dark spot film of the present disclosure can be applied to clean, dampened skin for 20 minutes. In an embodiment, additional water can be applied to an adhered film. The silk protein stabilization matrix in a dark spot film of the present disclosure protects the active ingredients from the air, to deliver their full benefits without the use of harsh chemicals or preservatives, such as paraben and phthalate. Thus, a dark spot film of the present disclosure is paraben and phthalate-free. Table 35 provides details of an embodiment of a film of the present disclosure.

[00434]

Table 35. An Embodiment of a Film of the Present Disclosure	
% Silk Solution (60 minute boil, 25kDA)	2.2%
Surface area	5.07cm^2
Volume of silk solution for casting	1.36mL
Mass of silk per film:	34mg
Mass of l-ascorbic acid per film:	23mg
Concentration of l-ascorbic acid in film:	40%
pH	3

[00435] A 2.1% silk solution of the present disclosure (0.321mL/cm^2) to 2.4% silk solution of the present disclosure (0.282mL/cm^2) can been used to create dark spot films of the present disclosure with 34mg of silk (6.7mg cm^2). in an embodiment, a 2.2% silk solution of the present disclosure (60 minute boil, 25kDA) is used to produce a film of the present disclosure. The % silk and volume of solution can vary to produce equivalent films. A dark spot film of the present disclosure can be made with different combinations of % silk and volume to produce films with silk quantities of 3mg/cm^2 to 10mg/cm^2. A dark spot film of the present disclosure can be made with from about 15 to

about 50% 1-ascorbic acid. A dark spot film of the present disclosure is soluble in water (insoluble border). A dark spot film of the present disclosure is clear/transparent. A dark spot film of the present disclosure has a pH 3 when water is applied. A dark spot film of the present disclosure can adhere to skin with water. A dark spot film of the present disclosure can dry when humidity of drying equipment is 16-40% and below the humidity of the lab

[00437] **Example 16. High Concentration Vitamin C Gels of the Present Disclosure**

[00438] High concentration vitamin C gels were pursued up to 20%). Vitamin C type, vitamin C concentration, % silk and pH were varied to increase the quantity of vitamin C in a gel.

[00439] Figs. 95A-95C are tables summarizing embodiments of high concentration vitamin C gels of the present disclosure. The highest concentration of vitamin C to gel was a 15% ascorbic acid 2 glucoside gel with 3.8% silk solution after 12 days. 5 and 10 % ascorbic acid-2-glucoside formulations with 2, 3 and 3.8% silk all gelled. For each group of % vitamin C, gelation first occurred in the 3.8% silk followed by the 3%) and lastly the 2%. It appears that there is a relationship between vitamin C concentration, silk concentration and gelation. If a solution has too much vitamin C in relation to silk, gelation will be prevented. Therefore, in order to produce high concentration vitamin C gels, higher concentration silk is necessary. One sample was cast at 5.5% silk and 20% vitamin C but gelation did not occur and a higher % silk may be necessary. Samples were also brought to a pH of 2 with lactic acid in order to help induce gelation in 3% silk solutions with 10 or 20% vitamin C, however gelation did not occur in 12 days.

[00440] **Example 17. Microbiological Study of Gels of the Present Disclosure**

[00441] Contaminating micro-organisms in cosmetics may cause a spoilage of the product and, when pathogenic, they represent a serious health risk for consumers worldwide. The United States Pharmacopoeia (USP) Microbial Limits Test provides several methods for the determination of total microbial count for bacteria, yeast and mold. Various gels of the present disclosure were tested to evaluate the possible microbial contamination in three different states of their use (intact, in-use, ending product). Fig. 96 is a table summarizing the results of such testing.

[00442] The samples of gel and water samples from carboys were analyzed for determination of CFU/mL (colony- forming units per milliliter) of aerobic bacteria as well as yeast and mold. Samples were exposed to growth medium of Tryptic Soy Agar (TSA) for bacteria and Potato Dextrose Agar (PDA) for fungi (yeast/mold) at an exposure temperature of 23±3°C. Samples were incubated at 30.0 ± 2°C for 3 days (bacteria) and 5 days (Fungi). Samples were then observed for determination of colony-forming units/mL.

[00443] The limit of detection for the assays was 10 CFU/ml or g for bacteria and fungi, and the values of < 10 indicate that microorganisms could not be detected in the samples. Values of > 1.00E+04 indicate that the microbial colonies are Too Numerous to Count in the dilutions plated.

[00444] **Example 18. UV Silk Foams and Liquids of the Present Disclosure**

[00445] In an embodiment, the vitamin C derivative sodium ascorbyl phosphate (DSM) was dissolved in water. Sodium hyaluronate ("HA") was then added to the water, mixed vigorously, and left to fully dissolve. The result is a viscous liquid (depending on HA %), The viscosity of the HA solution allows even dispersion of the zinc oxide and titanium dioxide and therefore HA is typically mixed before addition of UV additives. The zinc oxide and titanium dioxide are added to the HA solution and mixed vigorously, for example with the use of an electric blender. 60 minute boiled (~25 kDa) silk solution is then added and mixed to create a 1% silk formulation.

[00446] Two formulations were created without the addition of sodium ascorbyl phosphate (samples "HU2" and "HU4"). For sample HU2, zinc oxide and titanium dioxide were added and mixed by blending with an electric blender and whisk. The result was a viscous white liquid (Fig. 98 and Fig. 99). Silk was then added and blended with an electric blender and whisk. The solution became a creamy foam similar to shaving cream (Fig. 97 and Fig. 100). Vitamin E in the form of dl-alpha tocopheryl acetate can be added to the solution to recover a viscous liquid texture that can be applied with a smooth even texture (Fig. 98). With increasing the quantity of dl-alpha tocopheryl acetate, the formulation will become less foam-like and more of a smooth liquid or lotion texture.

[00447] HU4 was split into two batches: Fig. 99, batch 2 and Fig. 100, batch 1. The first batch followed the same procedures to HU2 and became a foam. For the second batch of U4, sodium ascorbyl phosphate was added and dissolved before adding any zinc, titanium or silk. The UV additives were then added by blending with an electric blender and whisk and created a standard white viscous liquid. Silk was then added with, an electric blender and whisk. The result was slightly thicker viscous liquid than normally seen. Without wishing to be bound by theory, it appears the addition of sodium ascorbyl phosphate inhibits foaming. Without wishing to be bound by theory, it appears that whisking, as opposed to mixing or blending, creates a silk foam.

[00448]

Table 36. Embodiments of UV Silk Foams and Liquids of the Present Disclosure

Sample	Total Volume	% silk	% HA (sodium hyaluronate)	Mass HA (g)	% ZnO	Mass ZnO (g)	% TiO_2	Mass TiO_2 (g)	Sodium Ascorbyl Phosphate (g)
HU2	55	1	2.5	1.375	12	6.6	3	1.65	N/A
HU4 Batch 1	27.5	1	3.5	0.9625	12	3.3	3	0.825	5.5
HU4 Batch 2	27.5	1	3.5	0.9625	12	3.3	3	0.825	N/A

[00449] **Example 19. Lyophilized Silk Powders of the Present Disclosure**

Table 37. Embodiments of lyophilized silk powders

Silk Solution	Treatment	Soluble
~60 kDa silk, 6% silk, pH=7-8	lyopholize and cut with blender	no
~60 kDa silk, 6% silk, pH=10	lyopholize and cut with blender	no
~25 kDa silk, 6% silk, pH=7-8	lyopholize and cut with blender	yes
~25 kDa silk, 6% silk, pH=10	lyopholize and cut with blender	yes

[00450]

[00451] The above silk solutions were transformed to a silk powder through lyophilization to remove bulk water and chopping to small pieces with a blender. pH was adjusted with sodium hydroxide. Low molecular weight silk (~25 kDa) was soluble while high molecular weight silk (~60 kDa) was not.

[00452] The lyophilized silk powder can be advantageous for enhanced storage control ranging from 10 days to 10 years depending on storage and shipment conditions. The lyophilized silk powder can also be used as a raw ingredient in the pharmaceutical, medical, consumer, and electronic markets. Additionally, lyophilized silk powder can be re-suspended in water, HFIP, or an organic solution following storage to create silk solutions of varying concentrations, including higher concentration solutions than those produced initially.

[00453] In an embodiment, aqueous pure silk fibroin-based protein fragment solutions of the present disclosure comprising 1%, 3%, and 5% silk by weight were each dispensed into a 1.8L Lyoguard trays, respectively. All 3 trays were placed in a 12 ft^2 lyophilizer and a single run performed. The product was frozen with a shelf temperature of $\leq$ -40°C and held for 2 hours. The compositions were then lyophilized at a shelf temperature of -20°C, with a 3 hour ramp and held for 20 hours, and subsequently dried at a temperature of 30°C, with a 5 hour ramp and held for about 34 hours. Trays were removed and stored at ambient conditions until further processing. Each of the resultant lyophilized silk fragment compositions were able to dissolve in aqueous solvent and organic solvent to reconstitute silk fragment solutions between 0.1 wt% and 8 wt%. Heating and mixing were not required but were used to accelerate the dissolving rate. All solutions were shelf-stable at ambient conditions.

[00454] In an embodiment, an aqueous pure silk fibroin-based protein fragment solution of the present disclosure, fabricated using a method of the present disclosure with a 30 minute boil, has a

molecular weight of about 57 kDa, a polydispersity of about 1.6, inorganic and organic residuals of less than 500 ppm, and a light amber color.

[00455] In an embodiment, an aqueous pure silk fibroin-based protein fragment solution of the present disclosure, fabricated using a method of the present disclosure with a 60 minute boil, has a molecular weight of about 25 kDa, a polydispersity of about 2.4, inorganic and organic residuals of less than 500 ppm, and a light amber color.

[00456] **Example 20. Formulation of Moisturizing Composition**

[00457] In an embodiment, a moisturizing composition comprises:

Water	65%-99% w/v
6% Silk solution	0.1%-5% v/v
Hyaluronic acid	0.1%-5% w/v
Jojoba Oil	0%-25% v/v
Rosehip Oil	0%-25% v/v
Vitamin E	0%-5% v/v
Aspen bark	0.5%-2% w/v
Sodium Anisate	0.1%-1% w/v
5N NaOH	0.1%-0.5%
2M HCl	0.5%-1.5%
Glycerin	0%-10% v/v
Coconut Oil	0%-25% v/v
Lemongrass Oil	0%-25% v/v
Shea butter	0%-25% v/v
Oat flour	0%-5% w/v
Titanium Oxide	0%-5% w/v
Zinc Oxide	0%-5% w/v

[00458] **Example 21. Formulation of Moisturizing Composition**

[00459] In an embodiment, a moisturizing composition comprises:

Water	65%-99% w/v
6% Silk solution	0.1%-5% v/v
Hyaluronic acid	0.1%-5% w/v
Jojoba Oil	0%-25% v/v
Rosehip Oil	0%-25% v/v
Vitamin E	0%-5% v/v
Aspen bark	0%-5% w/v
Sodium Anisate	0.1%-1% w/v
5N NaOH	0.1%-0.5%
2M HCl	0.5%-1.5%

[00460] **Example 22. Formulation of Moisturizing Composition**

[00461] In an embodiment, a moisturizing composition comprises:

Water	65%-99% w/v
6% Silk solution	0.1%-5% v/v
Hyaluronic acid	0.1%-5% w/v
Jojoba Oil	5%-15% v/v
Rosehip Oil	5%-15% v/v
Vitamin E	0.5%-2% v/v
Aspen bark	0.5%-2% w/v
Sodium Anisate	0.1%-1% w/v
5N NaOH	0.1%-0.5%
2M HCl	0.5%-1.5%

[00462] **Example 23. Formulation of Moisturizing Composition**

[00463] In an embodiment, a moisturizing composition comprises:

Water	65%-99% w/v
6% Silk solution	0.1%-5% v/v
Hyaluronic acid	0.1%-5% w/v

Oil or butter	0.1%-25% v/v
pH adjusting agent	0.1%-1.5% v/v

[00464] **Example 24. Formulation of Moisturizing Composition**

[00465] In an embodiment, a moisturizing composition comprises:

Water	65%-99% w/v
Silk protein fragments	0.01%-1% w/v
Hyaluronic acid	0.1%-5% w/v
Jojoba Oil	5%-15% v/v
Rosehip Oil	5%-15% v/v
Vitamin E	0.5%-2% v/v
5N NaOH	0.1%-0.5%
2M HCl	0.5%-1.5%

[00466] **Example 25. Formulation of Moisturizing Composition**

[00467] In an embodiment, a moisturizing composition comprises:

Water	65%-99% w/v
Silk protein fragments	0.01%-1% w/v
Hyaluronic acid	0.1%-5% w/v
Jojoba Oil	0%-25% v/v
Rosehip Oil	0%-25% v/v
Vitamin E	0%-5% v/v
Aspen bark	0%-5% w/v
Sodium Anisate	0.1%-1% w/v
5N NaOH	0.1%-0.5%
2M HCl	0.5%-1.5%

[00468] **Example 26. Formulation of Moisturizing Composition**

[00469] In an embodiment, a moisturizing composition comprises:

Water	65%-99% w/v
Silk protein fragments	0.06%-0.2% w/v

Hyaluronic acid	0.1%-5% w/v
Jojoba Oil	0%-25% v/v
Rosehip Oil	0%-25% v/v
Vitamin E	0%-5% v/v
Aspen bark	0%-5% w/v
Sodium Anisate	0.1%-1% w/v
5N NaOH	0.1%-0.5%
2M HCl	0.5%-1.5%

[00470] **Example 27. Moisturizer Composition User Testing**

[00471] A trial was conducted with 9 people on a moisturizer composition of the present disclosure. Six respondents (67% of respondents) reported using the moisturizer once a day. Three respondents reported using the moisturizer twice a day. No respondents reported using the moisturizer more than twice a day.

[00472] All respondents used the moisturizer in the morning and/or night. There was not a very strong preference between morning and night although morning was most popular. Four respondents reported only applying the moisturizer in the morning. Two respondents reported only applying the moisturizer at night. Three respondents reported applying the moisturizer both in the morning and at night.

[00473] Three respondents reported applying a serum before applying the moisturizer; in one case a respondent reported using a "complex c serum" before applying the moisturizer. Five respondents reported that they did not apply a serum before applying the moisturizer, while one respondent reported sometimes applying a serum before applying the moisturizer. Most respondents did not use a treatment serum before application of the moisturizer.

[00474] Four respondents reported applying makeup over the moisturizer. Three respondents reported they did not apply makeup over the moisturizer. Two respondents reported they sometimes applied makeup over the moisturizer. Most respondents did apply makeup over the moisturizer.

[00475] All respondents expressed that the moisturizer did moisturize the skin. 33% of respondents commented on how the moisturizer did not feel greasy/oily. 66% of respondents referred to the feeling as smooth/silky/soft. The overall feedback was excited and positive.

[00476] 88% of respondents (eight out of nine) said the application of the moisturizer was easy. The only negative response had a problem with the jar and spatula and would prefer a pump. Some respondents commented on the ease of spreading and absorbing into the skin.

[00477] The general feedback/comments were very positive with 66% of responses lacking any negative comment. Multiple respondents asked to put the product into production immediately so they could have it. The respondents also commented on the clean, smooth feel and desirable texture and appearance.

[00479] **Example 28. Formulation of Moisturizing Composition**

[00480] In an embodiment, a moisturizing composition that may provide a heavy moisturizer for intense hydration comprises:

Hyaluronic Acid	0.1-5% (w/v)
6% Silk Solution	0.1-25% (v/v)
Water	50%-99% (v/v)
Shea Butter	0-40% (v/v)
Coconut Oil	0-40% (v/v)
Vitamin E	0-5% (v/v)
Aspen Bark	0-5% (w/v)
Sodium Anisate	0.1 -5% (w/v)
5N NaOH	0.01-5% (v/v)
2M HCl	0.01-10% (v/v) ()

[00481] **Example 29. A Method for Manufacturing the Moisturizing Composition of Example 28.**

[00482] The exemplary moisturizing composition provided in Example 28 may be provided according to the following process.

[00483] Prepare a Pre-Casting Solution:

[00484] Prepare the hyaluronic acid (HA) solution:

[00485] Pour 68.2% (±1.0%) v/v of RO/DI water into a clean beaker (e.g., 1000 mL of solution * 0.682=682 mL RO/DI water).

[00486] Use a mixer to gently stir the RO/DI water (e.g., <600rpm with an overhead lab mixer for 2500 mL batch size). Slowly add 1.64% (±0.02%) w/v hyaluronic acid powder to the RO/DI water (e.g., 1000 mL of solution * 0.0164 = 16.4 g hyaluronic acid powder).

[00487] Once all of the HA has been added, use a mixer to mix the RO/DI water and HA vigorously until the HA is fully dissolved (e.g., 1000-2000 rpm with an overhead lab mixer for 2500 mL batch size. Use a speed that creates mixing throughout the entire volume of solution without splashing).

[00488] The HA powder may need to be scraped off of sides of container and stirrer after initial mixing with the use of a spatula. Undissolved HA powder will appear as white powder or concentrated groups of small bubbles. The HA is fully dissolved when the mixture is completely homogenous and has a consistent fluid flow per visual assessment. Check homogeneity by rotating and/or rocking the mixing container. HA powder will typically dissolve completely in 1-3 hours of vigorous mixing time.

[00489] Prepare the hyaluronic acid/silk solution:

[00490] To the RO/DI Water and HA mixture, add 4.3% (±0.01%) v/v 6.0% silk (e.g., 1000 mL of solution * 0.043=43 mL 6.0% silk).

[00491] Use a mixer to gently mix the solution until it is completely homogeneous per visual assessment (e.g., 100-400 rpm for a 2500 ml batch size with an overhead lab mixer). It typically takes approximately 5-10 minutes to reach complete homogeneity.

[00492] Store the hyaluronic acid/silk solution in a refrigerator overnight (at least 12 hours). Solution may be transferred to another container.

[00493] Prepare the Casting Solution:

[00494] Add the hyaluronic acid solution to a plastic or glass beaker if it is not already in an appropriate beaker or bowl.

[00495] In two separate beakers heat 12.8% (±0.1%) w/v shea butter (e.g., 1000 mL of solution * 0.128=128 mL shea butter) and 12.8% (±0.1%) w/v coconut oil (e.g., 1000 mL of solution * 0.128=128 mL coconut oil) in a 75°C laboratory oven to dissolve (approximately 30 min to 1 hour).

[00496] While the shea butter and coconut oil are heating, heat the hyaluronic acid/silk solution to 50°C (±5°C) with the use of a hot plate or lab oven. If using a hot plate, be sure to mix the solution gently with the use of a lab mixer so that the heated solution is evenly dispersed.

[00497] In a separate beaker mix to combine the heated shea butter and coconut oil, 0.9% (±0.01%) v/v Vitamin E (e.g., 1000 mL of solution * 0.009=9 mL Vitamin E) and 0.206% (±0.001%) v/v 5N NaOH (e.g., 1000 mL of solution * 0.00206=2.06 mL 5N NaOH). Mix for approximately 10 seconds (Note: may mix by hand).

[00498] Use a mixer to mix the hyaluronic acid/silk solution at a power of 300-800 rpm (overhead lab mixer) while the beaker is being heated with a hot plate at a heat setting of 3-5.

Mixing power and hot plate setting will be determined by batch size. A mixing speed that creates gentle mixing and agitation should be used.

[00499] Add the shea butter, coconut oil, vitamin E and 5N NaOH mixture to the mixing hyaluronic acid/silk solution. Increase mixing speed to create vigorous mixing and agitation (1200-2000 rpm for 2500 mL batch size). Mix until the solution is a white, lotion like, homogenous mixture. Continue to mix for at least 20 minutes.

[00500] Remove the solution from the hot plate and continue to stir. Immediately add 0.72% (±0.001%) v/v 2M Hydrochloric Acid (HCl) (e.g., 1000 mL of solution * 0.0072=7.2 mL 2M HCl).

[00501] As the 2M HCl is added, the solution will become very sticky and viscous. Some solution may stick to the mixing attachment. Periodically, stop mixing and remove the solution that is stuck to the attachment with the use of a spatula and continue mixing until mixture is homogenous.

[00502] Use a mixer to mix the solution vigorously (e.g. a power of 1000-2000 rpm with an overhead lab mixer for 2500 mL batch size) for at least 30 minutes.

[00503] Allow the solution to cool to less than 27°C by leaving at room temperature or by placing in a refrigerator to speed cooling.

[00504] To the mixture, add 0.95% (±0.005%) w/v aspen bark (e.g., 1000 mL of solution * 0.0095=95g Aspen Bark). Use a mixer to mix vigorously until the aspen bark is completely dissolved per visual assessment (e.g., speed of 6-10 for KitchenAid or 300-1500 rpm for an overhead lab mixer). Complete dissolution typically takes 10-20 minutes of vigorous mixing time.

[00505] To the mixture, add 0.4% (±0.005%) w/v sodium anisate (e.g., 1000 mL of solution * 0.004=4 g sodium anisate). Use a mixer to mix vigorously until the sodium anisate is completely dissolved per visual assessment (e.g., speed of 6-10 for KitchenAid or 300-1500 rpm for an overhead lab mixer). Complete dissolution typically takes 10-20 minutes of vigorous mixing time.

[00506] Casting Final Product:

[00507] Select and prepare clean product containers and arrange them for casting on a level surface. Dispense an appropriate volume of solution into a container.

[00508] **Example 30. Formulation of Moisturizing Composition**

[00509] In an embodiment, a moisturizing composition that may provide a lighter moisturizer for oily skin and a matte finish comprises:

Hyaluronic Acid	1.54% (w/v) (0.1-2.5%)
6% Silk Solution	1.75% (v/v) (0.1 – 25%)
Water	86.8% (v/v)
Rosehip Oil	5% (v/v) (0-15%)
Jojoba Oil	5% (v/v) (0-15%)
Vitamin E	0.9% (v/v) (0-5%)
Aspen Bark	0.9% (w/v) (0.5%)
Sodium Anisate	0.3% (w/v) (0.1-5%)
5N NaOH	0.15% (v/v) (0.01-5%)
2M HCl	0.38% (v/v) (0.01-10%)

[00510] **Example 31. A Method for Manufacturing the Moisturizing Composition of Example 30.**

[00511] The exemplary moisturizing composition provided in Example 30 may be provided according to the following process.

[00512] Prepare a Pre-Casting Solution:

[00513] Prepare the hyaluronic acid (HA) solution:

[00514] Pour 86.8% (±1.0%) v/v of RO/DI water into a clean beaker (e.g., 1000 mL of solution * 0.868=868 mL RO/DI water).

[00515] Use a mixer to gently stir the RO/DI water (e.g., <600 rpm with an overhead lab mixer for 2500 mL batch size). Slowly add 1.54% (±0.02%) w/v hyaluronic acid powder to the RO/DI water (e.g., 1000 mL of solution * 0.0154 = 154 g hyaluronic acid powder).

[00516] Once all of the HA has been added, use a mixer to mix the RO/DI water and HA vigorously until the HA is fully dissolved (e.g., 600-2000 rpm with an overhead lab mixer for 2500 mL batch size. Use speed that creates mixing throughout the entire volume of solution without splashing).

[00517] The HA powder may need to be scraped off of sides of container and stirrer after initial mixing with the use of a spatula. Undissolved HA powder will appear as white powder or concentrated groups of small bubbles. The HA is fully dissolved when the mixture is completely homogenous and has a consistent fluid flow per visual assessment. Check homogeneity by rotating

and/or rocking the mixing container. HA powder will typically dissolve completely in 1-3 hours of vigorous mixing time.

[00518] Prepare the hyaluronic acid/silk solution:

[00519] To the RO/DI Water and HA mixture, add 1.75% (±0.01%) v/v 6.0% silk (e.g., 1000 mL of solution * 0.0175=17.5 mL 6.0% silk).

[00520] Use a mixer to gently mix the solution until it is completely homogeneous per visual assessment (e.g., 100-400 rpm for a 2500 ml batch size with an overhead lab mixer). It typically takes approximately 5-10 minutes to reach complete homogeneity.

[00521] Store the hyaluronic acid/silk solution in a refrigerator overnight (at least 12 hours). Solution may be transferred to another container.

[00522] Prepare the Casting Solution:

[00523] Add the hyaluronic acid solution to a plastic or glass beaker if it is not already in an appropriate beaker.

[00524] In a separate beaker, mix to combine 5.0% (±0.1%) v/v jojoba oil (e.g., 1000 mL of solution * 0.05=50 mL jojoba oil), 5.0% (±0.1%) v/v rosehip oil (e.g., 1000 mL of solution * 0.05=50 mL rosehip oil), 0.9% (±0.01%) v/v Vitamin E (e.g., 1000 mL of solution * 0.009=9 mL Vitamin E) and 0.154% (±0.001%) v/v 5N NaOH (e.g., 1000 mL of solution * 0.00154=1.54 mL 5N NaOH). Mix for approximately 10 seconds.

[00525] Use a mixer to mix the hyaluronic acid solution at a power 300-800 rpm (overhead lab mixer). Mixing power will be determined by batch size. A mixing speed that creates gentle mixing and agitation should be used.

[00526] Add the jojoba oil, rosehip oil, vitamin E and 5N NaOH mixture to the hyaluronic acid/silk solution. Increase mixing speed to create vigorous mixing and agitation (1200-2000 rpm for 2500 mL batch size). Mix until the solution is a white, lotion like, homogenous mixture. Continue to mix for at least 20 minutes.

[00527] To the mixture, add 0.38% (±0.001%) v/v 2M Hydrochloric Acid (HCl) (e.g., 1000 mL of solution * 0.0038=3.8 mL 2M HCl).

[00528] As the 2M HCl is added, the solution will become very sticky and viscous. Some solution may stick to the mixing attachment. Periodically, stop mixing and remove the solution that

is stuck to the attachment with the use of a spatula and continue mixing until mixture is homogenous.

[00529] Use a mixer to mix the solution vigorously (e.g. a power of 1000-2000 rpm with an overhead lab mixer for 2500 mL batch size) for at least 30 minutes.

[00530] To the mixture, add 0.9% (±0.005%) w/v aspen bark (e.g., 1000 mL of solution * 0.009=9 g Aspen Bark). Use a mixer to mix vigorously until the aspen bark is completely dissolved per visual assessment (300-1500 rpm for an overhead lab mixer (~1000-1500 rpm for 2500 mL batch size)). Complete dissolution typically takes 10-20 minutes of vigorous mixing time.

[00531] To the mixture, add 0.3% (±0.005%) w/v sodium anisate (e.g., 1000 mL of solution * 0.003=3 g sodium anisate). Use a mixer to mix vigorously until the sodium anisate is completely dissolved per visual assessment (300-1500 rpm for an overhead lab mixer (~1000-1500 rpm for 2500 mL batch size)). Complete dissolution typically takes 10-20 minutes of vigorous mixing time

[00532] Casting Final Product:

[00533] Select and prepare clean product containers and arrange them for casting on a level surface. Dispense an appropriate volume of solution into each container.

[00534] **Example 32. Formulation of Moisturizing Composition**

[00535] In an embodiment, a moisturizing composition that may provide a body moisturizer comprises:

Hyaluronic Acid	1.75% (w/v) (0.1-5%)
6% Silk Solution	4.25% (v/v) (0.1-25%)
Water	70% (v/v)
Shea Butter	7.5% (v/v) (0-25%)
Coconut Oil	12.5% (v/v) (0-25%)
Jojoba Oil	5% (v/v) (0-25%)
Aspen Bark	0.95% (w/v) (0-5%)
Sodium Anisate	0.4% (w/v) (0.1-5%)
5N NaOH	0.2% (v/v) (0.01-5%)
2M HCl	0.7% (v/v) (0.01-10%)

[00536] **Example 33. Formulation of Moisturizing Composition**

[00537] In an embodiment, a moisturizing composition that may provide a moisturizer comprises:

Water	70-99% (w/v)
6% Silk Solution	0.1-5% (v/v)
Jojoba Oil	0-25% (v/v)
Rosehip Oil	0-25% (v/v)
Vitamin E	0-5% (v/v)
Aspen Bark	0.5-2% (w/v)
Sodium Anisate	0.1-1% (w/v)
5N NaOH	0.1-0.5% (v/v)
2M HCl	0.5-1.5% (v/v)

[00538] Other ingredients for the moisturizing composition may include one or more of:

Glycerin	0-10% (v/v)
Coconut Oil	0-25% (v/v)
Lemongrass Oil	0-25% (v/v)
Shea Butter	0-25% (v/v)
Oat Flour	0-5% (w/v)
Titanium Oxide	0-5% (w/v)

[00539] **Example 34: A Method for Manufacturing the Moisturizing Composition of Example 33.**

[00540] In preparing a moisturizing composition of Example 33, an amount of RO/DI water (X% v/v) may be added into a beaker or bowl (KitchenAid). An amount of hyaluronic acid powder (X% w/v) may be added to the RO/DI water. The mixture may be vigorously mixed at a power of 6-10 (KitchenAid) or 300-700 rpm (in a laboratory mixer) until the hyaluronic acid is fully dissolved (e.g., about 1 to 3 hours).

[00541] A 6% silk solution (X% v/v) may then be added to the prepared hyaluronic acid solution and mixed gently at a power of 2 (KitchenAid) or 50-80 rpm (in a laboratory mixer) until the silk

and hyaluronic acid solution are homogenous. The combined solution may then be stored in a refrigerator overnight. The solution can be transferred to another container.

[00542] The hyaluronic acid/silk solution may be added to a beaker or bowl (KitchenAid). To the prepared hyaluronic acid/silk solution may be added jojoba oil (X% v/v), rosehip oil (X% v/v), Vitamin E (X% v/v), and 5N NaOH (X% v/v). The mixture may be stirred at a power of 4-10 (KitchenAid) or 300-700 rpm (in a laboratory mixer). The mixture may be stirred until it provides a white, lotion like, homogenous mixture (see Figs. 101-107). The mixture may be stirred for about 10 minutes.

[00543] To the homogenous mixture may be added 2M HCl (X% v/v) and the mixture may be stirred at a power of 4-10 (KitchenAid) or 300-700 rpm (in a laboratory mixer). The mixture may be stirred for at least 15 minutes. Aspen bark (X% w/v) may then be added to the mixture and stirred at a power of 4-10 (KitchenAid) or 300-700 rpm (in a laboratory mixer). The mixture may be stirred for at least 15 minutes. Sodium anisate (X% w/v) may then be added to the mixture and stirred at a power of 4-10 (KitchenAid) or 300-700 rpm (in a laboratory mixer) for at least 15 minutes to yield a product moisturizing composition.

[00544] **Example 35: Moisturizer Shelf-Life Pilot Study**

[00545] A shelf-life pilot study was performed to examine the shelf-life stability of an exemplary moisturizing composition in both jars and pumps. Three 15 mL jars and three 30 mL pumps were filled with an exemplary moisturizing composition.

[00546] After one day, (1) the moisturizing composition in the jars was thick, opaque, uniform, and off-white in color (Fig. 108); and (2) the moisturizing composition in the pumps was thick, opaque, uniform, off-white in color, and included air pockets.

[00547] After twenty days, (1) the moisturizing composition in the jars was thick, opaque, uniform, and off-white in color (Fig. 110); and (2) the moisturizing composition in the pumps was thick, opaque, uniform, off-white in color, and included air pockets (Fig. 111).

[00548] Accordingly, upon completion of the pilot study, the moisturizing composition in the jars and pumps exhibited no change in color, consistency, or uniformity from day one to day twenty.

[00549] **Example 36. Formulation of Moisturizing Compositions**

[00550] A series of 61 moisturizing compositions was prepared (Fig. 112) and examined. Specifically, the moisturizing compositions were prepared with varying amounts of silk (% silk

(w/v)) in combination with a variety of additives (e.g., shea butter, jojoba, coconut oil, vitamin E, oat flour).

[00551] Example 37. Formulation of Sun Protectant

[00552] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	74 % (v/v)
Hyaluronic Acid	1.74 % (w/v)
6% Silk Solution	1.29 % (v/v)
Jojoba Oil	7.25 % (v/v)
Rosehip Oil	7.25 % (v/v)
Fractionated Coconut Oil	1.80 % (v/v)
Coconut Oil	1.40 % (v/v)
Titanium Dioxide	4.50 % (w/v)
Zinc Oxide	4.50 % (w/v)
5N NaOH	0.15 % (v/v)
2M HCl	3.80 % (v/v)
pH	Unknown

[00553] The resulting sun protection factor for the above-referenced formulation is 18.

[00554] Example 38. Formulation of a Sun Protectant

[00555] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	74.60 % (v/v)
Hyaluronic Acid	1.70 % (w/v)
6% Silk Solution	1.67 % (v/v)
Jojoba Oil	10.00 % (v/v)
Rosehip Oil	10.00 % (v/v)

Vitamin E	0.90 % (v/v)
Titanium Dioxide	5.00 % (w/v)
Zinc Oxide	5.00 % (w/v)
5N NaOH	0.15 % (v/v)
2M HCl	1.80 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.40 % (w/v)
pH	7.11

[00556] The resulting sun protection factor for the above-referenced formulation is about 7.5 to 19.

[00557] **Example 39. Formulation of a Sun Protectant**

[00558] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	12.10 % (v/v)
Hyaluronic Acid	1.00 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	20.00 % (v/v)
Shea Butter	35.00 % (v/v)
Raspberry Seed Oil	5.00 % (v/v)
Vitamin E	0.90% (v/v)
Glycerin	15.00 % (v/v)
Titanium Dioxide	3.50 % (w/v)
Zinc Oxide	3.50 % (w/v)
NaOH (pellets)	1.00 % (w/v)
2M HCl	10.00 % (v/v)
pH	6.56

[00559] The resulting sun protection factor for the above-referenced formulation is about 20.

[00560] **Example 40. Formulation of a Sun Protectant**

[00561] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	10.10 % (v/v)
Hyaluronic Acid	1.00 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	25.00 % (v/v)
Shea Butter	30.00 % (v/v)
Raspberry Seed Oil	10.00 % (v/v)
Vitamin E	0.90% (v/v)
Glycerin	10.00 % (v/v)
Titanium Dioxide	3.50 % (w/v)
Zinc Oxide	3.50 % (w/v)
NaOH (pellets)	75.00 % (w/v)
2M HCl	12.00 % (v/v)

[00562] The resulting sun protection factor for the above-referenced formulation is about 18.

[00563] **Example 41. Formulation of a Sun Protectant**

[00564] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	30.60% (v/v)
6% Silk Solution	1.50 % (v/v)
Jojoba Oil	25.00 % (v/v)
Coconut Oil	25.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	15.00 % (v/v)

Titanium Dioxide	5.00 % (w/v)
Zinc Oxide	5.00 % (w/v)
5N NaOH	1.80 % (v/v)
2M HCl	2.00 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.40 % (w/v)

[00565] Example 42. Formulation of a Sun Protectant

[00566] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	14.10 % (v/v)
6% Silk Solution	5.00 % (v/v)
Jojoba Oil	15.00 % (v/v)
Coconut Oil	25.00 % (v/v)
Shea Butter	25.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	15.00 % (v/v)
Titanium Dioxide	4.00 % (w/v)
Zinc Oxide	4.00 % (w/v)
NaOH (pellets)	2.00 % (w/v)
2M HCl	2.00 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.40 % (w/v)
pH	7

5

[00567] Example 43. Formulation of a Sun Protectant

[00568] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	10.10 % (v/v)

6% Silk Solution	2.00 % (v/v)
Coconut Oil	29.00 % (v/v)
Shea Butter	35.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	20.00 % (v/v)
Titanium Dioxide	4.00 % (w/v)
Zinc Oxide	4.00 % (w/v)
NaOH (pellets)	1.00 % (w/v)
2M HCl	5.00 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.40 % (w/v)
pH	7

[00569] Example 44. Formulation of a Sun Protectant

[00570] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	10.10 % (v/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	10.00 % (v/v)
Shea Butter	59.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	15.00 % (v/v)
Titanium Dioxide	4.00 % (w/v)
Zinc Oxide	4.00 % (w/v)
NaOH (pellets)	1.00 % (w/v)
2M HCl	5.00 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.40 % (w/v)
pH	7

[00571] Example 45. Formulation of a Sun Protectant

[00572] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	20.00 % (v/v)
Hyaluronic Acid	1.00 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	19.00 % (v/v)
Shea Butter	35.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	20.00 % (v/v)
Titanium Dioxide	4.00 % (w/v)
Zinc Oxide	4.00 % (w/v)
NaOH (pellets)	1.60 % (w/v)
2M HCl	5.00 % (v/v)
pH	7

[00573] Example 46. Formulation of a Sun Protectant

[00574] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	16.10 % (v/v)
Hyaluronic Acid	1.50 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	24.00 % (v/v)
Shea Butter	35.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	10.00 % (v/v)
Titanium Dioxide	4.00 % (w/v)
Zinc Oxide	4.00 % (w/v)
NaOH (pellets)	0.8 % (w/v)

2M HCl	12.00 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.30 % (w/v)
pH	6.5

[00575] Example 47. Formulation of a Sun Protectant

[00576] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	12.10 % (v/v)
Hyaluronic Acid	1.00 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	20.00 % (v/v)
Shea Butter	35.00 % (v/v)
Raspberry Seed Oil	5.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	15.00 % (v/v)
Titanium Dioxide	3.50 % (w/v)
Zinc Oxide	3.50 % (w/v)
NaOH (pellets)	1.00 % (w/v)
2M HCl	10.00 % (v/v)
pH	6.56

5

[00577] Example 48. Formulation of a Sun Protectant

[00578] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	10.10 % (v/v)
Hyaluronic Acid	1.00 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	25.00 % (v/v)

Shea Butter	30.00 % (v/v)
Raspberry Seed Oil	10.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	10.00 % (v/v)
Titanium Dioxide	3.50 % (w/v)
Zinc Oxide	3.50 % (w/v)
NaOH (pellets)	75.00 % (w/v)
2M HCl	12.00 % (v/v)

[00579] Example 49. Formulation of a Sun Protectant

[00580] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	25.00 % (v/v)
Hyaluronic Acid	1.00 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	29.00 % (v/v)
Shea Butter	25.00 % (v/v)
Raspberry Seed Oil	10.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	8.00 % (v/v)
Titanium Dioxide	1.50 % (w/v)
Zinc Oxide	6.00 % (w/v)
NaOH (pellets)	0.10 % (w/v)
2M HCl	5.00 % (v/v)
pH	5.5

[00581] Example 50. Formulation of a Sun Protectant

[00582] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	27.50 % (v/v)

Hyaluronic Acid	1.20 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	30.00 % (v/v)
Shea Butter	15.60 % (v/v)
Raspberry Seed Oil	12.50 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	4.00 % (v/v)
Titanium Dioxide	2.50 % (w/v)
Zinc Oxide	7.00 % (w/v)
NaOH (pellets)	0.15 % (w/v)
2M HCl	7.50 % (v/v)
pH	6.00

[00583]

[00584] Example 51. Formulation of a Sun Protectant

[00585] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	30.00 % (v/v)
Hyaluronic Acid	0.47 % (w/v)
6% Silk Solution	2.30 % (v/v)
Coconut Oil	30.00 % (v/v)
Shea Butter	13.00 % (v/v)
Raspberry Seed Oil	5.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	6.00 % (v/v)
Titanium Dioxide	7.14 % (w/v)
Zinc Oxide	12.00 % (w/v)
5N NaOH	0.10 % (v/v)
2M HCl	10.00 % (v/v)
Aspen Bark	0.90 % (w/v)

Sodium Anisate	0.30 % (w/v)
pH	5-6

[00586] Example 52. Formulation of a Sun Protectant

[00587] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	35.00 % (v/v)
Hyaluronic Acid	0.60 % (w/v)
6% Silk Solution	2.00 % (v/v)
Coconut Oil	30.00 % (v/v)
Shea Butter	14.00 % (v/v)
Raspberry Seed Oil	5.00 % (v/v)
Vitamin E	0.90 % (v/v)
Glycerin	7.00 % (v/v)
Titanium Dioxide	6.00 % (w/v)
Zinc Oxide	10.00 % (w/v)
5N NaOH	0.10 % (v/v)
2M HCl	6.00 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.30 % (w/v)
pH	6.1

[00588] Example 53. An Exemplary Formulation of a Sun Protectant

[00589] In an embodiment, a sun protection formulation that may provide a sun protectant may be:

Water	10-80 % (v/v)
Hyaluronic Acid	0-5 % (w/v)
6% Silk Solution	0.1-20 % (v/v)
Jojoba Oil	0-60 % (v/v)
Rosehip Oil	0-60 % (v/v)

Coconut Oil	0-60 % (v/v)
Shea Butter	0-60 % (v/v)
Raspberry Seed Oil	0-60 % (v/v)
Vitamin E	0-10 % (v/v)
Glycerin	0-80 % (v/v)
Titanium Dioxide	0-25 % (w/v)
Zinc Oxide	0-25 % (w/v)
5N NaOH	0.05-10 % (v/v)
NaOH (pellets)	0.05-10
2M HCl	0.1-30 % (v/v)
Aspen Bark	0-5 % (w/v)
Sodium Anisate	0-5 % (w/v)

[00590] Example 54. An Exemplary Method for Preparing the Sun Protection Formulations of Examples 41 to 53

[00591] A solution is first prepared by dissolving or otherwise adding NaOH to water. Where applicable, hyaluronic acid is added to the NaOH solution and stirred to dissolution. Where applicable, glycerin is also added to the solution and stirred. Silk is then added. The resulting mixture is then heated to about 50 to 60 ^{o}C with stirring. One or more of coconut oil, vitamin E, jojoba oil, shea butter, and raspberry seed oil are combined and then heated to about 70 ^{o}C with stirring. One or both of titanium dioxide and zinc oxide are then added to the oil blend and stirred. The combination of the oil blend and oxides are added to the aqueous mixture. The titanium oxide and/or zinc oxide may be added to the aqueous phase, the oil phase, or both. HCl is then added to the combined mixture and stirred. Where applicable, aspen bark and/or sodium anisate is then added with stirring.

[00592] Example 55. Formulation of a Stearic Acid Cleanser

[00593] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water	70.46 % (v/v)
6% Silk Solution	1.67 % (v/v)

Hyaluronic Acid	1.6 % (w/v)
5N NaOH	0.15 % (v/v)
Stearic Acid	10 % (v/v)
Jojoba Oil	15 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.30 % (w/v)
pH	6.03

[00594] Example 56. Formulation of a Stearic Acid Cleanser

[00595] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water	75.40 % (v/v)
6% Silk Solution	1.67 % (v/v)
Hyaluronic Acid	1.6 % (w/v)
5N NaOH	0.15 % (v/v)
Stearic Acid	5 % (v/v)
Olive Oil	3 % (v/v)
Jojoba Oil	12 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.30 % (w/v)
pH	5.94

[00596] Example 57. Formulation of a Stearic Acid Cleanser

[00597] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water	75.40 % (v/v)
6% Silk Solution	1.67 % (v/v)
Hyaluronic Acid	1.6 % (w/v)
5N NaOH	0.15 % (v/v)
Stearic Acid	5 % (v/v)
Coconut Oil	15 % (v/v)

Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.30 % (w/v)
pH	6.47

[00598] Example 58. An Exemplary Method for Preparing the Stearic Acid Cleansers of Examples 55-57

[00599] Dissolve hyaluronic acid in water to prepare a solution and then add silk slowly. Refrigerate the solution. Heat a combination of stearic acid, jojoba oil, coconut oil, and/or olive oil to about 75 °C. Then, heat the hyaluronic acid/silk solution to about 55 °C. Add stearic acid/jojoba oil combination to the hyaluronic acid/silk solution and mix vigorously. To the mixing solution, add NaOH and recover the product cleanser.

[00600] Example 59. Formulation of a Lauric Acid Cleanser

[00601] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water	75.40 % (v/v)
6% Silk Solution	1.67 % (v/v)
Hyaluronic Acid	1.6 % (w/v)
5N NaOH	0.15 % (v/v)
Lauric Acid	2 % (v/v)
Myristic Acid	2 % (v/v)
Jojoba Oil	15 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.30 % (w/v)
pH	7.17

[00602] Example 60. Formulation of a Lauric Acid Cleanser

[00603] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water	72.85 % (v/v)
6% Silk Solution	2.00 % (v/v)
Hyaluronic Acid	1.75 % (w/v)

5N NaOH	0.15 % (v/v)
Lauric Acid	2.50 % (v/v)
Stearic Acid	2.50 % (v/v)
Jojoba Oil	20 % (v/v)
Aspen Bark	0.90 % (w/v)
Sodium Anisate	0.30 % (w/v)
pH	7.26

[00604] Example 61. An Exemplary Method for Preparing the Lauric Acid Cleansers of Examples 59 and 60

[00605] Dissolve hyaluronic acid in water to prepare a solution and then add silk slowly. Refrigerate the solution. Heat a combination of lauric acid, jojoba oil, myristic acid, and/or stearic acid to about 75 ^{o}C. Then, heat the hyaluronic acid/silk solution to about 55 ^{o}C. Add the acid/jojoba oil combination to the hyaluronic acid/silk solution and mix. Allow the solution to cool and then add aspen bark and sodium anisate to provide the cleanser.

[00606] Example 62. Formulation of a Combination Cleanser

[00607] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	24.0%
6 % Silk Solution (v/v)	10.0%
Glycerin (v/v)	20.0%
NaOH Pellets (w/v)	5.0%
Lauric Acid (v/v)	5.0%
Myristic Acid (v/v)	20.0%
Stearic Acid (v/v)	10.0%
Oleic Acid (v/v)	10.0%
Aspen Bark (w/v)	0.5%
Sodium Anisate (w/v)	0.3%
pH	8.38

[00608] Example 63. Formulation of a Combination Cleanser

[00609] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	20.0%
6 % Silk Solution (v/v)	10.0%
Glycerin (v/v)	25.0%
NaOH Pellets (w/v)	4.0%
Lauric Acid (v/v)	5.0%
Myristic Acid (v/v)	10.0%
Stearic Acid (v/v)	10.0%
Oleic Acid (v/v)	10.0%
Jojoba Oil (v/v)	10.0%
Aspen Bark (w/v)	0.5%
Sodium Anisate (w/v)	0.3%
pH	8.42

[00610]

[00611] Example 64. Formulation of a Combination Cleanser

[00612] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	20.0%
6 % Silk Solution (v/v)	15.0%
Glycerin (v/v)	30.0%
NaOH Pellets (w/v)	4.0%
Lauric Acid (v/v)	15.0%
Oleic Acid (v/v)	15.0%
Jojoba Oil (v/v)	5.0%
Aspen Bark (w/v)	0.5%
Sodium Anisate (w/v)	0.3%
pH	8.42

[00613] Example 65. Formulation of a Combination Cleanser

[00614] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	23.5%
6 % Silk Solution (v/v)	5.9%
Glycerin (v/v)	14.7%
NaOH Pellets (w/v)	2.4%
Lauric Acid (v/v)	2.9%
Myristic Acid (v/v)	5.9%
Stearic Acid (v/v)	1.5%
Oleic Acid (v/v)	4.4%
Squalene Oil (v/v)	11.7%
Rosehip Oil (v/v)	26.4%
2M HCl (v/v)	3.22%
pH	8.5

[00615] **Example 66. Formulation of a Combination Cleanser**

[00616] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	25.2%
6 % Silk Solution (v/v)	5.8%
Glycerin (v/v)	15.0%
NaOH Pellets (w/v)	2.4%
Lauric Acid (v/v)	2.9%
Myristic Acid (v/v)	4.5%
Stearic Acid (v/v)	1.5%
Oleic Acid (v/v)	5.9%
Squalene Oil (v/v)	10.0%
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	3.3%
Aspen Bark (w/v)	0.9%
Sodium Anisate (w/v)	0.3%

pH	8.4

[00617] Example 67. Formulation of a Combination Cleanser

[00618] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	37.8% (20.8% initial, 17% end)
6 % Silk Solution (v/v)	4.6%
Glycerin (v/v)	12.0%
NaOH Pellets (w/v)	2.0%
Lauric Acid (v/v)	2.3%
Myristic Acid (v/v)	4.7%
Stearic Acid (v/v)	1.2%
Oleic Acid (v/v)	1.2%
Olive Oil (v/v)	33.7%
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	1.1%
Aspen Bark (w/v)	0.9%
Sodium Anisate (w/v)	0.3%
pH	8.9

[00619] Example 68. Formulation of a Combination Cleanser

[00620] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	38% (20% initial, 18% end)
6 % Silk Solution (v/v)	4.6%
Glycerin (v/v)	12.0%
NaOH Pellets (w/v)	2.0%
Lauric Acid (v/v)	2.0%
Myristic Acid (v/v)	4.5%

Stearic Acid (v/v)	1.0%
Oleic Acid (v/v)	4.0%
Olive Oil (v/v)	20.0%
Jojoba Oil (v/v)	13.5%
Lemongrass Oil (v/v)	0.4%
2M HCl (v/v)	1.1%
Aspen Bark (w/v)	0.9%
Sodium Anisate (w/v)	0.3%
pH	8.8

[00621] Example 69. Formulation of a Combination Cleanser

[00622] In an embodiment, a cleanser formulation that may provide a cleanser may be:

Water (v/v)	20% (initial), 3.25% (end)
6 % Silk Solution (v/v)	4.5%
Glycerin (v/v)	15.0%
NaOH Pellets (w/v)	2.0%
Myristic Acid (v/v)	5.4%
Stearic Acid (v/v)	2.1%
Oleic Acid (v/v)	4.0%
Olive Oil (v/v)	33%(initial), 11%(end)
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	1.3%
Aspen Bark (w/v)	0.9%
Sodium Anisate (w/v)	0.3%
pH	8.75

[00623] Example 70. An Exemplary Method for Preparing the Combination Cleansers of Examples 62 and 69

[00624] Heat lauric acid, stearic acid, myristic acid, oleic acid, squalene oil, rosehip oil, lemongrass oil, olive oil, and/or jojoba oil to about 75 ^{o}C. Then dissolve NaOH in water (or an

initial aliquot of water) and heat the solution to about 70 °C. To the NaOH solution add glycerin and silk, then add the blend of lauric acid, stearic acid, myristic acid, oleic acid, squalene oil, rosehip oil, lemongrass oil, olive oil, and/or jojoba oil. Allow the mixture to cool. Where applicable, reheat the mixture and add rosehip oil, squalene oil, and/or 2M HCl. Then, where applicable, add an ending aliquot of water and/or olive oil. Finally, add aspen bark and/or sodium anisate to yield the combination cleanser.

[00625] Example 71. Formulation of a Cleansing Silk Refresh Product

[00626] In an embodiment, a cleanser formulation that may provide a cleansing silk refresh product may be:

Water (v/v)	34.66% (18% initial, 16.66% end)
6% Silk Solution (v/v)	4.60%
Glycerin (v/v)	11.80%
NaOH pellets (w/v)	2.00%
Lauric Acid (v/v)	2.56%
Myristic Acid (v/v)	5.30%
Stearic Acid (v/v)	1.38%
Oleic Acid (v/v)	3.60%
Olive Oil (v/v)	33.00%
Lemongrass Oil (v/v)	
2M HCl (v/v)	1.10%
Aspen Bark(w/v)	0.90%
Sodium Anisate (w/v)	0.30%
pH	9.25

[00627] Example 72. Formulation of a Cleansing Silk Refresh Product

[00628] In an embodiment, a cleanser formulation that may provide a cleansing silk refresh product may be:

Water (v/v)	34.7% (18% initial, 16.7% end)
6% Silk Solution (v/v)	4.60%
Glycerin (v/v)	11.80%
NaOH pellets (w/v)	2.00%
Lauric Acid (v/v)	
Myristic Acid (v/v)	6.58%
Stearic Acid (v/v)	2.66%
Oleic Acid (v/v)	3.60%
Olive Oil (v/v)	33.00%
Lemongrass Oil (v/v)	0.20%
2M HCl (v/v)	1.10%
Aspen Bark(w/v)	0.90%
Sodium Anisate (w/v)	0.30%
pH	9.5

[00629] Example 73. Formulation of a Cleansing Silk Refresh Product

[00630] In an embodiment, a cleanser formulation that may provide a cleansing silk refresh product may be:

Water (v/v)	40% (21.8% initial, 18.2% end)
6% Silk Solution (v/v)	1.00%
Glycerin (v/v)	11.80%
NaOH pellets (w/v)	2.00%
Lauric Acid (v/v)	2.56%
Myristic Acid (v/v)	5.30%
Stearic Acid (v/v)	1.38%
Oleic Acid (v/v)	3.60%
Olive Oil (v/v)	33.00%

Lemongrass Oil (v/v)	0.20%
2M HCl (v/v)	2.00%
Aspen Bark(w/v)	0.90%
Sodium Anisate (w/v)	
pH	8.92

[00631] Example 74. Formulation of a Cleansing Silk Refresh Product

[00632] In an embodiment, a cleanser formulation that may provide a cleansing silk refresh product may be:

Water (v/v)	41.36% (21.36% initial, 19% end)
6% Silk Solution (v/v)	1.00%
Glycerin (v/v)	11.80%
NaOH pellets (w/v)	2.00%
Lauric Acid (v/v)	
Myristic Acid (v/v)	6.58%
Stearic Acid (v/v)	2.66%
Oleic Acid (v/v)	3.60%
Olive Oil (v/v)	33.00%
Lemongrass Oil (v/v)	
2M HCl (v/v)	4.00%
Aspen Bark(w/v)	
Sodium Anisate (w/v)	
pH	8.8

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[00633] Example 75. Formulation of a Cleansing Silk Refresh Product

[00634] In an embodiment, a cleanser formulation that may provide a cleansing silk refresh product may be:

Water (v/v)	38.6%

	(20% initial, 18.36% end)
6% Silk Solution (v/v)	1.00%
Glycerin (v/v)	11.80%
NaOH pellets (w/v)	2.00%
Lauric Acid (v/v)	2.56%
Myristic Acid (v/v)	5.30%
Stearic Acid (v/v)	1.38%
Oleic Acid (v/v)	3.60%
Olive Oil (v/v)	33.00%
Lemongrass Oil (v/v)	
2M HCl (v/v)	3.00%
Aspen Bark(w/v)	0.90%
Sodium Anisate (w/v)	0.40%
pH	9.06

[00635] Example 76. Formulation of a Cleansing Silk Refresh Product

[00636] In an embodiment, a cleanser formulation that may provide a cleansing silk refresh product may be:

Water (v/v)	36.16% (19% initial, 17.16% end)
6% Silk Solution (v/v)	1.00%
Glycerin (v/v)	12.00%
NaOH pellets (w/v)	2.00%
Lauric Acid (v/v)	2.56%
Myristic Acid (v/v)	5.30%
Stearic Acid (v/v)	1.38%
Oleic Acid (v/v)	3.60%
Olive Oil (v/v)	33.00%
Lemongrass Oil (v/v)	

2M HCl (v/v)	5.00%
Aspen Bark(w/v)	
Sodium Anisate (w/v)	0.50%
pH	8.5

[00637] Example 77. An Exemplary Method for Preparing the Cleansing Silk Refresh Products of Examples 71 and 76

[00638] Heat applicable acids, lemongrass oil, and/or olive oil to 75 °C. Dissolve NaOH in an initial aliquot of water and heat the solution to 70 °C. To the alkaline solution add glycerin and silk solution, then add the blend of applicable acids, lemongrass oil, and/or olive oil. Allow the mixture to cool and then add 2M HCl followed by an ending aliquot of water. Where applicable, then add the aspen bark and/or the sodium anisate.

[00639] Example 78. Formulation of a Cleansing Silk Complete Product

[00640] In an embodiment, a cleanser formulation that may provide a cleansing silk complete product may be:

Water (v/v)	17.5% (initial), 2.95% (end)
6% Silk (v/v)	4.5%
Glycerin (v/v)	15.0%
NaOH pellets (w/v)	2.0%
Myristic Acid (v/v)	6.3%
Stearic Acid (v/v)	2.5%
Oleic Acid (v/v)	4.0%
Olive Oil (v/v)	33%(initial), 11%(end)
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	3.3%
Aspen Bark(w/v)	0.9%
Sodium Anisate (w/v)	0.3%
pH	8.76

[00641] Example 79. Formulation of a Cleansing Silk Complete Product

[00642] In an embodiment, a cleanser formulation that may provide a cleansing silk complete product may be:

Water (v/v)	17.75% (initial), 2.5% (end)
6% Silk (v/v)	4.5%
Glycerin (v/v)	15.0%
NaOH pellets (w/v)	2.0%
Myristic Acid (v/v)	6.3%
Stearic Acid (v/v)	2.5%
Oleic Acid (v/v)	4.0%
Olive Oil (v/v)	33%(initial), 11%(end)
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	3.3%
Aspen Bark(w/v)	0.9%
Sodium Anisate (w/v)	0.3%

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[00643] Example 80. Formulation of a Cleansing Silk Complete Product

[00644] In an embodiment, a cleanser formulation that may provide a cleansing silk complete product may be:

Water (v/v)	17.75% (initial), 2.5% (end)
6% Silk (v/v)	4.5%
Glycerin (v/v)	15.0%
NaOH pellets (w/v)	2.0%
Myristic Acid (v/v)	6.3%
Stearic Acid (v/v)	2.5%
Oleic Acid (v/v)	4.0%

Olive Oil (v/v)	33%(initial), 11%(end)
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	3.3%
Aspen Bark(w/v)	0.9%
Sodium Anisate (w/v)	0.3%
pH	8.8

[00645] Example 81. Formulation of a Cleansing Silk Complete Product

[00646] In an embodiment, a cleanser formulation that may provide a cleansing silk complete product may be:

Water (v/v)	17.75% (initial), 2.5% (end)
6% Silk (v/v)	4.5%
Glycerin (v/v)	15.0%
NaOH pellets (w/v)	2.0%
Myristic Acid (v/v)	6.3%
Stearic Acid (v/v)	2.5%
Oleic Acid (v/v)	4.0%
Olive Oil (v/v)	33%(initial), 11%(end)
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	3.3%
Aspen Bark(w/v)	
Sodium Anisate (w/v)	
pH	8.98

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[00647] Example 82. Formulation of a Cleansing Silk Complete Product

[00648] In an embodiment, a cleanser formulation that may provide a cleansing silk complete product may be:

Water (v/v)	17.75% (initial), 2.5%

	(end)
6% Silk (v/v)	4.5%
Glycerin (v/v)	15.0%
NaOH pellets (w/v)	2.0%
Myristic Acid (v/v)	6.3%
Stearic Acid (v/v)	2.5%
Oleic Acid (v/v)	4.0%
Olive Oil (v/v)	33%(initial), 11%(end)
Lemongrass Oil (v/v)	0.2%
2M HCl (v/v)	3.3%
Aspen Bark(w/v)	
Sodium Anisate (w/v)	
pH	8.98

[00649] Example 83. Formulation of a Cleansing Silk Complete Product

[00650] In an embodiment, a cleanser formulation that may provide a cleansing silk complete product may be:

Water (v/v)	20.2% (initial), 5% (end)
6% Silk (v/v)	1.00%
Glycerin (v/v)	15.00%
NaOH pellets (w/v)	2.00%
Myristic Acid (v/v)	6.25%
Stearic Acid (v/v)	2.50%
Oleic Acid (v/v)	4.00%
Olive Oil (v/v)	33%(initial), 11%(end)
Lemongrass Oil (v/v)	
2M HCl (v/v)	3.30%
Aspen Bark(w/v)	
Sodium Anisate (w/v)	0.30%

pH	8.82

[00651] Example 84. An Exemplary Method for Preparing the Cleansing Silk Complete Products of Examples 79 and 83

[00652] Heat applicable acids, olive oil (an initial aliquot), and/or lemongrass oil to about 75 °C. Dissolve NaOH in an initial aliquot of water and heat the solution to 70 °C. To the alkaline solution add glycerin and silk solution, then add the blend of applicable acids, lemongrass oil, and/or olive oil. Allow the mixture to cool and then add 2M HCl followed by ending aliquots of water and olive oil. Where applicable, then add aspen bark and and/or sodium anisate.

[00653] Example 85. An Exemplary Cleansing Silk Refresh Formulation

[00654] In an embodiment, a cleanser formulation that may provide a cleansing silk refresh product may include:

Water (v/v)	10-60% (total of initial and ending aliquots)
6% Silk (v/v)	0.1-20%
Glycerin (v/v)	0-50%
NaOH pellets (w/v)	0.1-5%
Lauric Acid (v/v)	0-10%
Myristic Acid (v/v)	0-20%
Stearic Acid (v/v)	0-5%
Oleic Acid (v/v)	0-10%
Olive Oil (v/v)	5-50%
2M HCl (v/v)	
Sodium Anisate (w/v)	0.1-5%
pH	8 to 9

[00655]

[00656] Example 86. An Exemplary Cleansing Silk Complete Formulation

[00657] In an embodiment, a cleanser formulation that may provide a cleansing silk complete product may include:

Water (v/v)	10-40% (total of initial and ending aliquots)
6% Silk (v/v)	0.1-20%
Glycerin (v/v)	0-50%
NaOH pellets (w/v)	0.1-5%
Myristic Acid (v/v)	0-20%
Stearic Acid (v/v)	0-5%
Oleic Acid (v/v)	0-10%
Olive Oil (v/v)	10-75%
Sodium Anisate (w/v)	0.1-5%
pH	8 to 9

[00658]

[00659] Example 87. Microbial and Fungal Challenge Testing for Cleansing Agents

[00660] The formulations of Examples 71, 72, 73, 75, 76, 78, 80, and 81 were tested to determine their anti-microbial and anti-fungal activities. Each of the tested formulations was found to have anti-bacterial and anti-fungal properties. Each of these tested formulations passed antibacterial and antifungal challenge testing specified in ISO standard ISO 11930.

[00661] Example 88. Patch (Sensitivity) Testing for Cleansing Agents

[00662] The formulations of Examples 71, 72, 73, 75, 76, 78, 80, and 81 were tested for irritation and sensitization by Repeated Insult Patch Testing. Each tested formulation was considered a non-primary irritant and non-primary sensitizer confirmed by a dermatologist.

[00663] Example 89. Shelf Life Testing for Cleansing Agents

[00664] The formulations of Examples 71, 72, 78, 80, and 81 were tested to determine their shelf life. The cleansers of the formulations were placed in a 40 ^{o}C incubator to test time stability. The time stability results are provided below:

Cleanser Formulation	**Test Result**
Example 78	Over 4.5 months without phase separation

Example 80	Over 4 months without phase separation
Example 81	Over 4 months without phase separation
Example 71	Phase separation at 4 months
Example 72	Over 4 months without phase separation

[00665] Example 90. An Exemplary Moisturizer Formulation

[00666] In an embodiment, a moisturizer formulation that may provide a hyaluronic acid free moisturizer may include:

Water (v/v)	10.0%
6% Silk (v/v)	10.00%
Glycerin (v/v)	55.00%
NaOH pellets (w/v)	2.00%
Coconut Oil	10.00%
Vitamin E	0.90%
Shea Butter	10.00%
2M HCl (v/v)	3.30%
Aspen Bark(w/v)	0.90%
Sodium Anisate (w/v)	0.30%
pH	5 to 8.5

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[00667] Example 91. An Exemplary Method for Preparing the Moisturizer of Example 90.

[00668] The glycerin, silk solution, and NaOH may be added to water and heated to about 70 ^{o}C. Vitamin E, coconut oil, and shea butter may be heated to about 70 ^{o}C. The oils may be then be added to the glycerin and silk solution under vigorous stirring while heating. The mixture may be

allowed to cool. Then 2M HCl, aspen bark, and sodium anisate may be added to produce the moisturizer.

[00669] Example 92. Formulation of a Deodorant Base Product

[00670] In an embodiment, a deodorant formulation that may provide a deodorant base product may be:

Water (v/v)	5.00 %
6% silk solution (v/v)	0.30 %
Beeswax (w/v)	34 %
Coconut Oil (w/v)	28.00 %
Shea Butter (w/v)	20 %
Glycerin (v/v)	5 %
Sunflower Oil (v/v)	2 %
Vitamin E Oil (v/v)	2 %

[00671] Example 93. An Exemplary Formulation of a Deodorant Base Product

[00672] In an embodiment, a deodorant formulation that may provide a deodorant base product may include:

Water (v/v)	1-20 %
6% silk solution (v/v)	0.1-5 %
Beeswax (w/v)	10-50 %
Coconut Oil (w/v)	0-40 %
Shea Butter (w/v)	0-60 %
Glycerin (v/v)	0-15 %
Sunflower Oil (v/v)	0-10 %
Vitamin E Oil (v/v)	0-5 %
Preservative (w/v) (e.g., aspen bark, sodium anisate, glyceryl caprylate, sodium phytate)	0.1-5 %

[00673] Example 94. An Exemplary Formulation of a Deodorant or Antiperspirant Product

[00674] In an embodiment, a deodorant or antiperspirant formulation of the invention may include:

Aluminum based compounds (w/v)	up to 25%
Mineral Salts (including aluminum) (w/v)	up to 25%
Talcum Powder (w/v)	up to 20%
Sodium bicarbonate (w/v)	up to 20%
Sodium stearate (w/v)	up to 20%
Witch Hazel (v/v)	up to 20%
Baking Soda (w/v)	up to 20%
Hops (w/v)	up to 20%
Aloe Vera (w/v)	up to 10%
Essential Oils (v/v) (antibacterial/antifungal properties)	up to 10%

[00675] Example 95. Formulation of a Foot Balm

[00676] In an embodiment, a foot balm formulation that may provide a foot balm product may include:

Water (v/v)	5.00 %
6% silk solution (v/v)	0.30 %
Beeswax (w/v)	34 %
Coconut Oil (w/v)	28.00 %
Shea Butter (w/v)	20 %
Glycerin (v/v)	5 %
Sunflower Oil (v/v)	2 %
Vitamin E Oil (v/v)	2 %
Preservative (w/v) (e.g., aspen bark, sodium anisate, glyceryl caprylate,	

sodium phytate)	
Antimicrobial essential oil (v/v) (e.g., lemongrass oil, eucalyptus oil, tea tree oil, rosemary oil)	2 %

[00677] Example 96. An Exemplary Formulation of a Foot Balm

[00678] In an embodiment, an exemplary foot balm formulation that may provide a footbalm product may include:

Water (v/v)	1-20 %
6% silk solution (v/v)	0.1-5 %
Beeswax (w/v)	10-50 %
Coconut Oil (w/v)	0-40 %
Shea Butter (w/v)	0-60 %
Glycerin (v/v)	0-15 %
Sunflower Oil (v/v)	0-10 %
Vitamin E Oil (v/v)	0-5 %
Preservative (w/v) (e.g., aspen bark, sodium anisate, glyceryl caprylate, sodium phytate)	0.1-5 %
Antimicrobial essential oil (v/v) (e.g., lemongrass oil, eucalyptus oil, tea tree oil, rosemary oil)	0-2 %

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[00679] Example 97. Formulation of a Shampoo

[00680] In an embodiment, a shampoo formulation that may provide a shampoo product may include:

Water (v/v)	40 %
6% Silk (v/v)	2 %
Glycerin (v/v)	10 %

NaOH pellets (w/v)	2 %
Lauric Acid (v/v)	3 %
Myristic Acid (v/v)	7 %
Stearic Acid (v/v)	3 %
Oleic Acid (v/v)	17 %
Olive Oil (v/v)	9 %
2M HCl (v/v)	5 %
Sodium Anisate (w/v)	1 %
Essential Oils (v/v)	1 %

[00681] Example 98. Formulation of a Shampoo

[00682] In an embodiment, a shampoo formulation that may provide a shampoo product may include:

Water (v/v)	40 %
6% Silk (v/v)	2 %
Glycerin (v/v)	10 %
NaOH pellets (w/v)	2 %
Sodium Lauryl/Laureth Sulfate (v/v) (e.g., ammonium lauryl sulfate)	30 %
Olive Oil (v/v)	9 %
2M HCl (v/v)	5 %
Sodium Anisate (w/v)	1 %
Essential Oils (v/v)	1 %

[00683]

[00684] Example 99. An Exemplary Formulation of a Shampoo

[00685] In an embodiment, an exemplary shampoo formulation that may provide a shampoo product may include:

Water (v/v)	5 to 75 %
6% Silk (v/v)	0.1-20 %

Glycerin (v/v)	0-50 %
NaOH pellets (w/v)	0.1-5 %
Lauric Acid (v/v)	0-10 %
Myristic Acid (v/v)	0-20 %
Stearic Acid (v/v)	0-5 %
Oleic Acid (v/v)	0-30 %
Olive Oil (v/v)	5-40 %
2M HCl (v/v)	
Sodium Anisate (w/v)	0.1-5 %
Essential Oils (v/v)	0.1-20 %

[00686] Example 100. An Exemplary Formulation of a Shampoo

[00687] In an embodiment, an exemplary shampoo formulation that may provide a shampoo product may include:

Water (v/v)	5 to 75 %
6% Silk (v/v)	0.1-20 %
Glycerin (v/v)	0-50 %
NaOH pellets (w/v)	0.1-5 %
Sodium Lauryl/Laureth Sulfate (v/v)	0-50 %
Olive Oil (v/v)	5-40 %
2M HCl (v/v)	
Sodium Anisate (w/v)	0.1-5 %
Essential Oils (v/v)	0.1-20 %

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[00688] Example 101. Formulation of a Conditioner

[00689] In an embodiment, a conditioner formulation that may provide a conditioner product may include:

Water (v/v)	78 %
6% Silk (v/v)	2 %

Hyaluronic Acid (w/v)	1.4 %
Glycerin (v/v)	2 %
NaOH pellets (w/v)	2 %
Stearic Acid (v/v)	3 %
Oleic Acid (v/v)	7 %
Olive Oil (v/v)	5 %
2M HCl (v/v)	4 %
Sodium Anisate (w/v)	1 %
Essential Oils (v/v)	1 %

[00690] Example 102. An Exemplary Formulation of a Conditioner

[00691] In an embodiment, an exemplary conditioner formulation that may provide a conditioner product may include:

Water (v/v)	40-95 %
6% Silk (v/v)	0.1-20 %
Hyaluronic Acid (w/v)	0.5-5 %
Glycerin (v/v)	0-50 %
NaOH pellets (w/v)	0.1-5 %
Stearic Acid (v/v)	0-10 %
Oleic Acid (v/v)	0-20 %
Olive Oil (v/v)	5-40 %
2M HCl (v/v)	
Sodium Anisate (w/v)	0.1-5 %
Essential Oils (v/v)	0.1%-20 %

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[00692] Example 103. Formulation of a Lip Balm

[00693] In an embodiment, a lip balm formulation that may provide a lip balm product may be:

Water (v/v)	9.40 %
6% silk solution (v/v)	0.60 %

Beeswax (v/v)	27.50 %
Coconut Oil (v/v)	37.50 %
Shea Butter (v/v)	18.50 %
Sweet Orange Essential Oil (v/v)	0.50 %
Sunflower Oil (v/v)	5.00 %
Vitamin E Oil (v/v)	1.00 %

[00694] Example 104. Method of Manufacturing the Lip Balm of Example 103

[00695] Vitamin E, sunflower oil, and sweet orange oil were heated in one beaker to about 70 °C. Coconut oil, shea butter, and beeswax was melted at about 75 °C. The two mixtures were combined under heating at about 80 °C. To the mixture was added silk solution under vigorous stirring at about 35 °C. Poured heated mixture into mold or tube at room temperature and placed in an oven at 50 °C for about 15 minutes. Then, placed filled mold or tube into a 35 °C oven for about 15 minutes. The filled mold or tube was then allowed to stand at room temperature until hard.

[00696] Example 105. Formulation of a Lip Balm

[00697] In an embodiment, a lip balm formulation that may provide a lip balm product may be:

Water (v/v)	4.70 %
6% silk solution (v/v)	0.30 %
Beeswax (w/v)	34.00 %
Coconut Oil (w/v)	28.85 %
Shea Butter (w/v)	19.00 %
Glycerin (v/v)	5.00 %
Sunflower Oil (v/v)	5.00 %
Vitamin E Oil (v/v)	2.50 %
Dermofeel PA-3 (v/v)	0.20 %
Spearmint Essential Oil (v/v)	0.15 %
Peppermint Essential Oil (v/v)	0.30 %

[00698] Example 106. Formulation of a Lip Balm

[00699] In an embodiment, a lip balm formulation that may provide a lip balm product may be:

Water (v/v)	4.70 %
6% silk solution (v/v)	0.30 %
Beeswax (w/v)	34 %
Coconut Oil (w/v)	28.85 %
Shea Butter (w/v)	19 %
Glycerin (v/v)	5 %
Sunflower Oil (v/v)	2.7 %
Vitamin E Oil (v/v)	1.00 %
Glyceryl Caprylate (w/v)	4.00 %
Spearmint Essential Oil (v/v)	0.15 %
Peppermint Essential Oil (v/v)	0.30 %

[00700] **Example 107. Formulation of a Lip Balm**

[00701] In an embodiment, a lip balm formulation that may provide a lip balm product may be:

Water (v/v)	4.70 %
6% silk solution (v/v)	0.30 %
Beeswax (w/v)	34 %
Coconut Oil (w/v)	28.85 %
Shea Butter (w/v)	19 %
Glycerin (v/v)	5 %
Sunflower Oil (v/v)	5 %
Vitamin E Oil (v/v)	1.75 %
Glyceryl Caprylate (w/v)	0.95 %
Spearmint Essential Oil (v/v)	0.15 %
Peppermint Essential Oil (v/v)	0.30 %

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[00702] **Example 108. Formulation of a Lip Balm**

[00703] In an embodiment, a lip balm formulation that may provide a lip balm product may be:

Water (v/v)	4.70 %
6% silk solution (v/v)	0.30 %
Beeswax (w/v)	34 %
Coconut Oil (w/v)	28.85 %
Shea Butter (w/v)	19 %
Glycerin (v/v)	5 %
Sunflower Oil (v/v)	5 %
Vitamin E Oil (v/v)	2.20 %
Glyceryl Caprylate (w/v)	0.50 %
Spearmint Essential Oil (v/v)	0.15 %
Peppermint Essential Oil (v/v)	0.30 %

[00704] Example 109. An Exemplary Formulation of a Lip Balm

[00705] In an embodiment, a lip balm formulation that may provide a lip balm product may include:

Water (v/v)	4.70 %
6% silk solution (v/v)	0.30 %
Beeswax (w/v)	31.40 %
Coconut Oil (w/v)	31.40 %
Shea Butter (w/v)	17.85 %
Glycerin (v/v)	5.00 %
Sunflower Oil (v/v)	6.00 %
Vitamin E Oil (v/v)	2.40 %
Glyceryl Caprylate (w/v)	0.50 %
Essential Oil (v/v) (e.g., spearmint oil, peppermint oil)	0.45 %

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[00706] Example 110. An Exemplary Formulation of a Lip Balm

[00707] In an embodiment, a lip balm formulation that may provide a lip balm product may include:

Water (v/v)	0.1-25 %
6% silk solution (v/v)	0.01-1.6 %
Beeswax (w/v)	20-50 %
Coconut Oil (w/v)	10-50 %
Shea Butter (w/v)	10-50 %
Glycerin (v/v)	0-20 %
Sunflower Oil (v/v)	0-20 %
Vitamin E Oil (v/v)	0-20 %
Glyceryl Caprylate (w/v)	0-5 %
Spearmint Essential Oil (v/v)	0-3 %
Peppermint Essential Oil (v/v)	0-25 %
pH	5 to 6

[00708] **Example 111. Method of Manufacturing the Lip Balms of Examples 105 to 110.**

[00709] In one beaker, vitamin E, beeswax, shea butter, coconut oil, and essential oils are combined. The mixture is then heated to about 75 ^{o}C. In a covered glass beaker, glycerin, silk solution and gyceryl caprylate are combined and heated to about 70 ^{o}C. The mixture of oils are then added into the aqueous solution and mixed under heating at about 75 ^{o}C for about 10 minutes. The heated mixture is then poured into a mold or tube at room temperature to provide the lip balm product. Once filled and semi-hard, additional heated mixture is poured over top of the mold or tube to provide a smoother top.

[00710] **Example 112. Lip Balm Stability Study**

[00711] Certain lip exemplary lip balms of the invention were tested to determine their stability over a period of days. Stability was determined by examining the lip balm products. Lip balm stability is indicated in the table below:

Formulation	**Days stable**
Example 103	161

Example 105	134
Example 106	111
Example 107	111
Example 108	111

[00712] Example 113. Lip Balm Thermal Stress Test

[00713] Two exemplary lip balm products were placed in a 40 °C incubator and a 60 °C incubator, with their caps off, to see if they would melt. One week later, none of the tubes showed any signs of stress. At the 3 week time point, all of the 40 °C lip balm products showed no signs of change. The 60 °C lip balm products had a very small amount of liquid melted, a slight darkening in color (from off white to light beige) and had some brown spots/solid-crust (speculated to be vitamin E). The 40 °C lip balm products were then frozen at about -20 °C for two days and thawed without showing signs of stress. The purpose of this test was to ensure the lip balm products would not melt at temperatures consumers might subject them to for short periods of time.

[00714] Example 114. Lip Balm Microbial Challenge Testing

[00715] Lip balm products of the invention were tested to determine their anti-fungal and anti-bacterial properties. Each of these tested formulations passed anti-bacterial and anti-fungal challenge testing specified in ISO standard ISO 11930, with the exception of Example 103. Examples 103, 105, 106, 107, and 108 were tested as shown below:

Formulation	**Result**
Example 103	Failed bacteria and fungi
Example 105	Passed bacteria and fungi
Example 106	Passed bacteria and fungi
Example 107	Passed bacteria and fungi
Example 108	Passed bacteria and fungi

[00716] All patents, patent applications, and published references cited herein are hereby incorporated by reference in their entirety. While the methods of the present disclosure have been described in connection with the specific embodiments thereof, it will be understood that it is capable of further modification. Further, this application is intended to cover any variations, uses, or

adaptations of the methods of the present disclosure, including such departures from the present disclosure as come within known or customary practice in the art to which the methods of the present disclosure pertain.

[00717] It will be appreciated by those skilled in the art that changes could be made to the exemplary embodiments shown and described above without departing from the broad inventive concepts thereof. It is understood, therefore, that this invention is not limited to the exemplary embodiments shown and described, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the claims. For example, specific features of the exemplary embodiments may or may not be part of the claimed invention and various features of the disclosed embodiments may be combined. Unless specifically set forth herein, the terms "a", "an" and "the" are not limited to one element but instead should be read as meaning "at least one".

[00718] It is to be understood that at least some of the figures and descriptions of the invention have been simplified to focus on elements that are relevant for a clear understanding of the invention, while eliminating, for purposes of clarity, other elements that those of ordinary skill in the art will appreciate may also comprise a portion of the invention. However, because such elements are well known in the art, and because they do not necessarily facilitate a better understanding of the invention, a description of such elements is not provided herein.

[00719] Further, to the extent that the methods of the present invention do not rely on the particular order of steps set forth herein, the particular order of the steps should not be construed as limitation on the claims. Any claims directed to the methods of the present invention should not be limited to the performance of their steps in the order written, and one skilled in the art can readily appreciate that the steps may be varied and still remain within the spirit and scope of the present invention.

CLAIMS

We claim:

1. A composition comprising:

about 0.0001% to about 90% (w/v) of pure silk fibroin-based protein fragments that are substantially devoid of sericin,

about 0.1% to about 99% (v/v) of an oil, and

about 99% to about 0.1% (v/v) water;

wherein the pH of the composition is in the range of 4 to 9,

wherein the composition forms a stable emulsion,

wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 5 kDa to about 80 kDa, and

wherein the pure silk fibroin-based protein fragments have a polydispersity of between about 1.5 and about 3.0.

2. The composition of claim 1, comprising about 0.01% to about 2% (w/v) of the pure silk fibroin-based protein fragments.

3. The composition of claim 1, comprising about 0.05% to about 0.3% (w/v) of the pure silk fibroin-based protein fragments.

4. The composition of claim 1, wherein the pH of the composition is in the range of 5 to 8.

5. The composition of claim 1, wherein the pH of the composition is in the range of 5 to 7.

6. The composition of claim 1, comprising about 0.1% to about 25% of an oil, and about 99% to about 75% water.

7. The composition of claim 1, comprising about 25% to about 50% of an oil, and about 75% to about 50% water.

8. The composition of claim 1, comprising about 50% to about 75% of an oil, and about 50% to about 25% water.

9. The composition of claim 1, comprising about 75% to about 99% of an oil, and about 25% to about 0.1% water.

10. The composition of any one of claims 1 to 9, wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 5 kDa to about 18 kDa.

11. The composition of any one of claims 1 to 9, wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 17 kDa to about 40 kDa.

12. The composition of any one of claims 1 to 9, wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 39 kDa to about 80 kDa.

13. The composition of any one of claims 1 to 12, further comprising about 0.1% to about 8% (w/v) of hyaluronic acid.

14. The composition of any one of claims 1 to 12, further comprising about 0.5% to about 2% (w/v) of hyaluronic acid.

15. The composition of any one of claims 1 to 14, wherein the stable emulsion is selected from the group consisting of a water-in-oil (w/o) emulsion and an oil-in-water (o/w) emulsion.

16. The composition of any one of claims 1 to 15, wherein the composition is in a form selected from the group consisting of a liquid, semisolid, solid, lotion, cream, oil, gel, emulsion, stick, spray ointment, paste, mousse, foam, and suspension.

17. The composition of any one of claims 1 to 16, wherein the oil is selected from the group consisting of an aliphatic oil, a fatty alcohol, a fatty acid, a glyceride (an acylglycerol), a phospholipid, and combinations thereof.

18. The composition of claim 17, wherein the oil is a glyceride, and the glyceride is selected from the group consisting of a monoglyceride, a diglyceride, and a triglyceride.

19. The composition of any one of claims 1 to 16, wherein the oil comprises one or more natural or essential oils.

20. The composition of any one of claims 1 to 19, further comprising about 0.1% to about 25% of a second oil.

21. The composition of claim 20, wherein the second oil comprises one or more natural or essential oils.

22. The composition of any one of claims 1 to 21, further comprising about 0.1% to about 5% (w/v) or (v/v) of a pH adjusting agent.

23. The composition of claim 22, wherein the pH adjusting agent is selected from the group consisting of sodium hydroxide (NaOH), potassium hydroxide (KOH), hydrochloric acid (HCl), citric acid, and combinations thereof.

24. The composition of claim 22, further comprising about 0.1% to about 5% (w/v) or (v/v) of a second pH adjusting agent.

25. The composition of claim 24 wherein the second pH adjusting agent is selected from the group consisting of sodium hydroxide (NaOH), potassium hydroxide (KOH), hydrochloric acid (HCl), citric acid, and combinations thereof.

26. The composition of claim 24, wherein the first pH adjusting agent is sodium hydroxide (NaOH) and the second pH adjusting agent is hydrochloric acid (HCl).

27. The composition of any one of claims 1 to 26, further comprising an additive.

28. The composition of claim 28, wherein the additive is selected from the group consisting of vitamin E, vitamin A, vitamin B, vitamin C, aspen bark, sodium anisate, oat flour, titanium oxide, titanium dioxide, glycerin, zinc oxide, a preservative, an aluminum based compound, a mineral salt, talcum powder, sodium bicarbonate, hops, aloe vera, witch hazel, and combinations thereof.

29. The composition of claim 28, wherein the additive is a combination of vitamin E, aspen bark, and sodium anisate.

30. The composition of any of claims 1 to 29, further comprising a sunscreen or sunblock.

31. The composition of claim 30, wherein the sunscreen or sunblock is selected from the group consisting of amiloxate (isopentyl-4-methoxycinnamate), para-aminobenzoic acid,

Benzophenone-9 (sodium dihydroxy dimethoxy disulfobenzophenone), padimate O (octyldimethyl para-aminobenzoic acid), phenylbenzimidazole sulfonic acid, cinoxate, dioxybenzone, oxybenzone, homosalate, menthyl anthranilate, 4-methylbenzylidene camphor, Mexoryl XL (drometrizole trisiloxane), Neo Heliopan AP (disodium phenyl dibenzimidazole tetrasulfonate), octocrylene, octyl methoxycinnamate, octyl salicylate, sulisobenzone, Tinosorb M (bisoctrizole, methylene bis-benzotriazolyl tetramethylbutylphenol), titanium dioxide, zinc oxide, micronized titanium dioxide, micronized zinc oxide, oil soluble zinc oxide, Tinosorb S (bis-ethylhexyloxyphenol methoxyphenol triazine), Tinsorb A2B (tris-biphenyl triazine), trolamine salicylate, avobenzone, ecamsule, titanium dioxide, 4-MBC, Uvinul T 150 (octyl triazone), Uvinul A Plus (diethylamino hydroxybenzoyl hexyl benzoate), Parsol SLX (dimethico-diethylbenzalmalonate), zinc oxide, melanin, a melanin derivative, raspberry seed oil, carrot oil, and combinations thereof.

32. The composition of claim 31, wherein the sunscreen or sunblock is selected from the group consisting of titanium dioxide, zinc oxide, micronized titanium dioxide, micronized zinc oxide, oil soluble zinc oxide, octylcrylene, avobenzone, octinoxate, octisalate, oxybenzone, homosalate, helioplex, 4-MBC, mexoryl SX and SL, tinosorb S and M, uvinul T 150, uvinul A plus, and a combination thereof.

33. The composition of any of claims 1 to 32, wherein the composition comprises an emollient.

34. The composition of claim 33, wherein the emollient comprises one or more of a hydrocarbon oil, a hydrocarbon wax, a silicone oil, an acetoglyceride ester, an ethoxylated glyceride, an alkyl ester of a fatty acid, an alkenyl ester of a fatty acid, a fatty acid, a fatty alcohol, afatty alcohol ether, an ether-ester, lanolin, a lanolin derivative, a polyhydric alcohol, a polyether derivative, a polyhydric ester, a wax ester, a beeswax derivative, a vegetable wax, a natural or essential oil, a phospholipid, a sterol, and an amide.

35. The composition of any of claims 1-34, wherein the composition is in the form of a sunscreen, a cleanser, a bar of soap, a lip balm, a foot balm, a deodorant stick, an antiperspirant stick, a liquid deodorant, a spray deodorant, a liquid antiperspirant, a spray antiperspirant, a conditioner, a shampoo, or a combination thereof.

36. A method for preparing a composition comprising the steps of:

providing a composition comprising:

about 0.0001% to about 90% (w/v) of pure silk fibroin-based protein fragments that are substantially devoid of sericin,

about 99% to about 0.1% (v/v) of water;

adding a first pH adjusting agent to adjust the pH of the composition to at least 10;

adding about 0.1% to about 99% (v/v) of an oil;

mixing the composition until it is homogeneous;

adding a second pH adjusting agent to adjust the pH of the composition to the range of 4 to 9; and

storing the composition for a period of time, wherein the composition remains a stable emulsion;

wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 5 kDa to about 80 kDa, and

wherein the pure silk fibroin-based protein fragments have a polydispersity of between about 1.5 and about 3.0.

37. The method of claim 36, wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 5 kDa to about 18 kDa.

38. The method of claim 36, wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 17 kDa to about 40 kDa.

39. The method of claim 36, wherein the pure silk fibroin-based protein fragments have an average weight average molecular weight ranging from about 39 kDa to about 80 kDa.

40. The method of any one of claims 36 to 39, further comprising the step of adding 0.1% to 8% (w/v) hyaluronic acid.

41. The method of any one of claims 36 to 39, further comprising about 0.1% to about 8% (w/v) of hyaluronic acid.

42. The method of any one of claims 36 to 41, wherein the stable emulsion is selected from the group consisting of a water-in-oil (w/o) emulsion and an oil-in-water (o/w) emulsion.

43. The method of any one of claims 36 to 42, further comprising the step of adding an additive.

44. The method of any one of claims 36 to 43, wherein the oil is selected from the group consisting of jojoba oil, rosehip oil, glycerin, coconut oil, lemongrass oil, shea butter, or a combination thereof.

45. A method of improving skin hydration comprising applying a moisturizing composition once daily to human skin for a period of at least one week, wherein the moisturizing composition comprises:

about 0.1% to about 5% silk solution, wherein the silk solution comprises about 1% to about 10% (w/v) of pure silk fibroin-based protein fragments that are substantially devoid of sericin;

about 0.1% to about 5% (w/v) of hyaluronic acid;

about 0.1% to about 25% (v/v) of an oil or butter; and

about 0.1% to about 1.5% (v/v) of a pH adjusting agent.

46. A method of improving skin hydration comprising applying a moisturizing composition once daily to human skin for a period of at least one week, wherein the moisturizing composition comprises:

about 0.06% to about 0.3% (w/v) pure silk fibroin-based protein fragments that are substantially devoid of sericin;

about 0.1% to about 5% (w/v) of hyaluronic acid;

about 0.1% to about 25% (v/v) of an oil or butter; and

about 0.1% to about 1.5% (v/v) of a pH adjusting agent.

47. A method of improving skin hydration comprising applying a moisturizing composition once daily to human skin for a period of at least one week, wherein the moisturizing composition comprises:

about 1 % to about 5 % silk solution (v/v), wherein the silk solution comprises about 1% to about 10% (w/v) of pure silk fibroin-based protein fragments that are substantially devoid of sericin;

about 1 % to about 3 % (w/v) of hyaluronic acid;

about 1 % to about 15% (v/v) of an oil or butter; and

about 0.1 % to about 1 % (v/v) of a pH adjusting agent.