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**(54) Title:** SILICONE HYDROGEL CONTACT LENSES

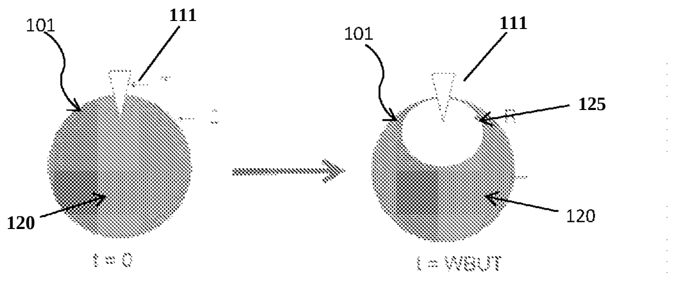


Figure 1

**(57) Abstract:** The present invention generally relates to inherently wettable silicone hydrogel contact lenses formed from a silicone hydrogel lens formulation that comprises a polysiloxane vinylic crosslinker having H-donor moieties, a siloxane-containing vinylic monomer with or without H-donor moieties, and a N-vinyl amide monomer. The inherently wettable silicone hydrogel contact lenses can have a combination of the desired contact lens properties including relatively high oxygen permeability, relatively high water content, relatively low modulus, and relatively-low surface atomic Si percentage. The present invention is also related to a method for making such inherently wettable silicone hydrogel contact lenses.

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*[Continued on next page]*

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# Silicone Hydrogel Contact Lenses

The present invention generally relates to silicone hydrogel contact lenses having an inherently wettable surface and to a method for producing the same.

## BACKGROUND

Silicone hydrogel (SiHy) contact lenses, which are made of a hydrated, crosslinked polymeric material that contains silicone and a certain amount of water within the lens polymer matrix at equilibrium, are increasingly becoming popular, because they have minimal adverse effects on corneal health due to their high oxygene permeability. But, incorporation of silicone in a contact lens material can have undesirable effects on the hydrophilicity and wettability, of SiHy contact lenses, because silicon is hydrophobic and has a great tendency to migrate onto the lens surface being exposed to air. Contact lenses manufacturers have made a great effort in developing SiHy contact lenses having a hydrophilic and wettable surface.

One approach for modifying the hydrophilicity and wettability of a SiHy contact lens is through the use of a plasma treatment, for example, commercial lenses, such as AIR OPTIX® (Alcon), PremiO™ (Menicon), and PUREVISION ™ (Bausch & Lomb), utilize this approach in their production processes. Although a plasma coating is durable and can provide an adequate hydrophilicity/wettability, plasma treatment of SiHy contact lenses may not be cost effective, because the preformed SiHy contact lenses must typically be dried before plasma treatment and because of relative high capital investment associated with plasma treatment equipment.

Another approach is to attach hydrophilic polymers onto the SiHy contact lens according to various mechanisms (see for example, U.S. Pat. Nos. 60991 22, 6436481 , 6440571 , 6447920, 6465056, 6521 352, 6586038, 6623747, 6730366, 6734321 , 683541 0, 6878399, 6923978, 6440571 , and 6500481 ; U.S. Pat. Appl. Pub. Nos. 2009-01 45086 A 1, 2009-01 45091 A 1, 2008-01 42038 A 1, and 2007-01 22540 A 1). Although those techniques can be use in rendering a SiHy contact lens wettable, they may not be cost-effective and/or time-efficient for implementation in a mass production environment, because they typically require relatively long time and/or involve laborious, multiple steps to obtain a hydrophilic coating.

Another approach is a layer-by-layer (LbL) polyionic material deposition technique (see, e.g., U.S. Pat. Nos. 6451 871 , 671 9929, 6793973, 6884457, 6896926, 6926965, 6940580, 7297725, 80441 12, 7858000, and 81581 92). Although the LbL deposition technique can provide a cost effective process for rendering a SiHy contact lens wettable, LbL coatings may not be as durable as plasma coatings and may have relatively high densities of surface charges; which may interfere with contact lens cleaning and disinfecting solutions. To improve the durability, crosslinking of LbL coatings on contact lenses has been proposed in U.S. Pat. Nos. 8147897 and 8142835. However, crosslinked LbL coatings may have a hydrophilicity and/or wettability inferior than original LbL coatings (prior to crosslinking) and still have relative high densities of surface charges.

Recently, a new approach has been described in US8529057 for applying a non-silicone hydrogel coating onto a SiHy contact lens directly in a lens package during autoclave (sterilization). Although this new approach can provide silicone hydrogel contact lenses with durable hydrophilic coatings thereon, it may not be environmentally friendly manufacturing process because it involves use of organic solvents in lens processing steps after the lens molding step.

Another approach is the incorporation of preformed hydrophilic polymers as polymeric wetting agents in a lens formulation for making SiHy contact lens as proposed in U.S. Pat. Nos. 6367929, 682201 6, 70521 31, and 7249848. This method may not require additional processes for modifying the hydrophilicity and wettability of SiHy contact lenses after cast-molding. However, polymeric wetting agents may not be compatible with the silicone components in the lens formulation and the incompatibility may impart haziness to the resultant lenses. Further, such surface treatment may not provide a durable surface for extended wear purposes.

A further approach is the incorporation of monomeric wetting agents (e.g., N-vinylpyrrolidone, N-vinyl-N-methyl acetamide, or the like) in a lens formulation for making SiHy contact lens as proposed in U.S. Pat. Nos. 6867245, 72681 98, 7540609, 7572841, 7750079, 7934830, 8231218, 8367746, 8445614, 8481662, 8487058, 8513325, 8703891, 8820928, 8865789, 89371 10, 89371 11, 9057821, 9057822, 9121998, 9,125,808, 9140825, 9140908, 9156934, 9164298, 9170349, 9188702, 9217813, 92961 59, 9322959, 9322960, 9360594, 95291 19. Commercial SiHy contact lenses, such as, Biofinity® (CooperVision, Dk=128 barrers, 48% H20), Avaira™ (CooperVision, Dk=100 barrers, 46% H20), Clariti™ (CooperVision, Dk=60 barrers, 56%), MyDay® (CooperVision, Dk=80 barrers, 54% $H_2$0), ULTRA (Bausch & Lamb, Dk=114 Barrers, 46% H20) (Bausch & Lomb), may utilize this approach in their production processes. Although this approach might be used in the commercial SiHy lens production to provide fresh (unused) SiHy lenses with adequately hydrophilic surfaces, there are some limitations. For example, the higher oxygen permeability of a SiHy contact lens could be achieved according to this approach, but at the expense of its equilibrium water content and atomic Si percentage at lens surface. Typically, relatively-lower equilibrium water content and relatively-higher atomic Si percentage go with higher oxygen permeability in tandem. Further, it may also have one or more of the following disadvantages: slightly-high haziness; a relatively-higher surface silicone content; susceptibility to form dry spots and/or hydrophobic surface areas created due to air exposure, dehydrating-rehydrating cycles, shearing forces of the eyelids, silicone migration, and/or partial failure to prevent silicone from exposure; and not-adequate lubricity.

## SUMMARY OF THE INVENTION

The invention, in one aspect, provides a silicone hydrogel contact lens, comprising a silicone hydrogel bulk material which comprises (1) first repeating units of at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties, (2) second repeating units of at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having one or more second H-donor moieties, (3) third repeating units of at least one hydrophilic N-vinyl amide monomer, and (4) optionally fourth repeating units of at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties, wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker, wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of -NHR°, amino linkages of -NH- , amide linkages of -CONH-, urethane linkages of -OCONH- , or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl, wherein the silicone hydrogel bulk material comprises at least 8.8 mmoles of the third repeating units per gram of all the first, second and fourth repeating units in total and at least 0.11 meq of all the first, second and third H-donor moieties in total per gram of the third repeating units, wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers, an elastic modulus of from about 0.2 MPa to about 1.5 MPa, and an equilibrium water content of from about 40% to about 70% and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds and a water contact angle by captive bubble of about 80 degrees or less without being subjected to any post-curing surface treatment.

In another aspect, the present invention provides a method for producing inherently-wettable silicone hydrogel contact lenses. The method comprises the steps of: preparing a polymerizable composition which is clear at room temperature and optionally but preferably at a temperature of from about 0 to about 4°C, wherein the polymerizable composition comprises (a) at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties, (b) at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having one or more second H-donor moieties, (c) at least one hydrophilic N-vinyl amide monomer, (d) optionally at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties, and (e) at least one free radical initiator, wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker, wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of -NHR $^0$, amino linkages of -NH- , amide linkages of -CONH- , urethane linkages of -OCONH- , or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl, wherein the polymerizable composition comprises at least 8.8 mmoles of component (c) per gram of all components (a), (b) and (d) in total and at least 0.11 meqs of all the first, second and third H-donor moieties in total per gram of component (c); introducing the polymerizable composition into a lens mold; curing thermally or actinically the polymerizable composition in the lens mold to form a silicone hydrogel contact lens, wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers, an elastic modulus of from about 0.2 MPa to about 1.5 MPa, and an equilibrium water content of from about 40% to about 70% and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds and a water contact angle by captive bubble of about 80 degrees or less without being subjected to any post-curing surface treatment.

These and other aspects of the invention will become apparent from the following description of the presently preferred embodiments. The detailed description is merely illustrative of the invention and does not limit the scope of the invention, which is defined by the appended claims and equivalents thereof.

## BRIEF DESCRIPTION OF DRAWINGS

Figure 1 schematically shows how to measure water-break-up time of a contact lens.

## DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Generally, the nomenclature used herein and the laboratory procedures are well known and commonly employed in the art. Conventional methods are used for these procedures, such as those provided in the art and various general references. Where a term is provided in the singular, the inventors also contemplate the plural of that term. The nomenclature used herein and the laboratory procedures described below are those well-known and commonly employed in the art. Also, as used in the specification including the appended claims, reference to singular forms such as "a," "an," and "the" include the plural, and reference to a particular numerical value includes at least that particular value, unless the context clearly dictates otherwise. "About" as used herein means that a number referred to as "about" comprises the recited number plus or minus 1-10% of that recited number.

"Contact Lens" refers to a structure that can be placed on or within a wearer's eye. A contact lens can correct, improve, or alter a user's eyesight, but that need not be the case. A contact lens can be of any appropriate material known in the art or later developed, and can be a soft lens, a hard lens, or a hybrid lens. A "silicone hydrogel contact lens" refers to a contact lens comprising a silicone hydrogel bulk (core) material.

A "soft contact lens" refers to a contact lens which has an elastic modulus (i.e., Young's modulus) of less than 2.5 MPa.

A "hydrogel" or "hydrogel material" refers to a crosslinked polymeric material which has three-dimensional polymer networks (i.e., polymer matrix), is insoluble in water, but can hold at least 10 percent by weight of water in its polymer matrix when it is fully hydrated.

A "silicone hydrogel" refers to a silicone-containing hydrogel obtained by copolymerization of a polymerizable composition comprising at least one silicone-containing monomer or at least one silicone-containing macromer or at least one crosslinkable silicone-containing prepolymer.

As used in this application, the term "non-silicone hydrogel" refers to a hydrogel that is theoretically free of silicon.

"Hydrophilic," as used herein, describes a material or portion thereof that will more readily associate with water than with lipids.

A "vinylic monomer" refers to a compound that has one sole ethylenically unsaturated group, is soluble in a solvent, and can be polymerized actinically or thermally.

The term "room temperature" refers to a temperature of about 21°C to about 27°C.

The term "soluble", in reference to a compound or material in a solvent, means that the compound or material can be dissolved in the solvent to give a solution with a concentration of at least about 0.02% by weight at room temperature.

The term "insoluble", in reference to a compound or material in a solvent, means that the compound or material can be dissolved in the solvent to give a solution with a concentration of less than 0.005% by weight at room temperature.

As used in this application, the term "ethylenically unsaturated group" is employed herein in a broad sense and is intended to encompass any groups containing at least one >C=C< group. Exemplary ethylenically unsaturated groups include without limitation (meth)acryloyl ($-\overset{O}{\overset{\|}{C}}-\overset{CH_3}{\overset{|}{C}}=CH_2$ and/or $-\overset{O}{\overset{\|}{C}}-CH=CH_2$), allyl, vinyl, styrenyl, or other C=C containing groups.

The term "terminal (meth)acryloyl group" refers to one (meth)acryloyl group at one of the two ends of the main chain (or backbone) of an organic compound as known to a person skilled in the art.

The term "(meth)acrylamide" refers to methacrylamide and/or acrylamide.

The term "(meth)acrylate" refers to methacrylate and/or acrylate.

As used herein, "actinically" in reference to curing, crosslinking or polymerizing of a polymerizable composition, a prepolymer or a material means that the curing (e.g., crosslinked and/or polymerized) is performed by actinic irradiation, such as, for example, UV/visible irradiation, ionizing radiation (e.g. gamma ray or X-ray irradiation), microwave irradiation, and the like. Thermal curing or actinic curing methods are well-known to a person skilled in the art.

A "hydrophilic vinylic monomer", as used herein, refers to a vinylic monomer which as a homopolymer typically yields a polymer that is water-soluble or can absorb at least 10 percent by weight of water.

A "hydrophobic vinylic monomer", as used herein, refers to a vinylic monomer which as a homopolymer typically yields a polymer that is insoluble in water and can absorb less than 10 percent by weight of water.

A "blending vinylic monomer" refers to a vinylic monomer capable of dissolving both hydrophilic and hydrophobic components of a polymerizable composition to form a solution.

An "acrylic monomer" refers to a vinylic monomer having one sole (meth)acryloyl group.

An "N-vinyl amide monomer" refers to an amide compound having a vinyl group ($-CH=CH_2$) that is directly attached to the nitrogen atom of the amide group.

A "macromer" or "prepolymer" refers to a compound or polymer that contains ethylenically unsaturated groups and has a number average molecular weight of greater than 700 Daltons.

As used in this application, the term "vinylic crosslinker" refers to a compound having at least two ethylenically unsaturated groups. A "vinylic crosslinking agent" refers to a vinylic crosslinker having a molecular weight of 700 Daltons or less.

As used in this application, the term "polymer" means a material formed by polymerizing/crosslinking one or more monomers or macromers or prepolymers or combinations thereof.

As used in this application, the term "molecular weight" of a polymeric material (including monomeric or macromeric materials) refers to the number average molecular weight unless otherwise specifically noted or unless testing conditions indicate otherwise.

A "polysiloxane segment" refers to a polymer chain consisting of at least three consecutively- and directly-linked siloxane units (divalent radical) each independent of one another having a formula of $-\underset{R_2'}{\overset{R_1'}{\mathrm{Si}}}-O-$ in which $R_1'$ and $R_2'$ are two substituents independently selected from the group consisting of $C_1$-$C_{10}$ alkyl, $C_1$-$C_4$ alkyl- or $C_1$-$C_4$- alkoxy-substituted phenyl, $C_1$-$C_{10}$ fluoroalkyl, $C_1$-$C_{10}$ fluoroether, $C_6$-$C_{18}$ aryl radical, $-alk-(OC_2H_4)_{\gamma 1}-OR^{o}$ (in which alk is Ci-$C_6$ alkyl diradical, R° is H or CrC $_4$ alkyl and γ1 is an integer from 1 to 10), a C2-C40 organic radical having at least one functional group selected from the group consisting of hydroxyl group (-OH ), carboxyl group (-COOH) , -NR$_3$'R4', amino linkages of - N R3'-, amide linkages of -CONR $_3$'-, amide of -CONR3'R $_4$', urethane linkages of -OCONH- , and C1-C4 alkoxy group, or a linear hydrophilic polymer chain, in which R3' and R4' independent of each other are hydrogen or a C1-C15 alkyl.

A "polysiloxane vinylic crosslinker" refers to a compound comprising at least one polysiloxane segment and at least two ethylenically-unsaturated groups.

A "linear polysiloxane vinylic crosslinker" refers to a compound comprising a main chain which includes at least one polysiloxane segment and is terminated with one ethylenically-unsaturated group at each of the two ends of the main chain.

A "chain-extended polysiloxane vinylic crosslinker" refers to a compound comprising at least two ethylenically-unsaturated groups and at least two polysiloxane segments each pair of which are linked by one divalent radical.

A "linear chain-extended polysiloxane vinylic crosslinker" refers to a compound comprising a main chain which is terminated with one ethylenically-unsaturated group at each of the two ends of the main chain and which includes at least two polysiloxane segments, each pair of which are linked by one divalent radical.

The term "fluid" as used herein indicates that a material is capable of flowing like a liquid.

As used in this application, the term "clear" in reference to a polymerizable composition means that the polymerizable composition is a transparent solution or liquid mixture (i.e., having a light transmissibility of 85% or greater, preferably 90% or greater in the range between 400 to 700 nm).

The term "alkyl" refers to a monovalent radical obtained by removing a hydrogen atom from a linear or branched alkane compound. An alkyl group (radical) forms one bond with one other group in an organic compound.

The term "alkylene divalent group" or "alkylene diradical" or "alkyl diradical" interchangeably refers to a divalent radical obtained by removing one hydrogen atom from an alkyl. An alkylene divalent group forms two bonds with other groups in an organic compound .

The term "alkoxy" or "alkoxyl" refers to a monovalent radical obtained by removing the hydrogen atom from the hydroxyl group of a linear or branched alkyl alcohol. An alkoxy group (radical) forms one bond with one other group in an organic compound.

In this application, the term "substituted" in reference to an alkyl diradical or an alkyl radical means that the alkyl diradical or the alkyl radical comprises at least one substituent which replaces one hydrogen atom of the alkyl diradical or the alkyl radical and is selected from the group consisting of hydroxyl (-OH ), carboxyl (-COOH), $-NH_2$, sulfhydryl (-SH), $C_1$-$C_4$ alkyl, C1-C4 alkoxy, C1-C4 alkylthio (alkyl sulfide), C1-C4 acylamino, C1-C4 alkylamino, di-C1-C4 alkylamino, and combinations thereof.

A free radical initiator can be either a photoinitiator or a thermal initiator. A "photoinitiator" refers to a chemical that initiates free radical crosslinking/polymerizing reaction by the use of light. A "thermal initiator" refers to a chemical that initiates radical crosslinking/polymerizing reaction by the use of heat energy.

The intrinsic "oxygen permeability", Dk, of a material is the rate at which oxygen will pass through a material. As used in this application, the term "oxygen permeability (Dk)" in reference to a hydrogel (silicone or non-silicone) or a contact lens means a corrected oxygen permeability ($Dk_c$) which is measured at about 34-35°C and corrected for the surface resistance to oxygen flux caused by the boundary layer effect according to the procedures described in Example 1 of U.S. Pat. Appl. Pub. No. 2012-0026457 A1. Oxygen permeability is conventionally expressed in units of barrers, where "barrer" is defined as $[(cm^3 \text{ oxygen})(mm) / (cm^2)(sec)(mm\ Hg)] \times 10^{-10}$.

The "oxygen transmissibility", Dk/t, of a lens or material is the rate at which oxygen will pass through a specific lens or material with an average thickness of t [in units of mm] over the area being measured. Oxygen transmissibility is conventionally expressed in units of barrers/mm, where "barrers/mm" is defined as $[(cm^3 \text{ oxygen})/(cm^2)(sec)(mm\ Hg)] \times 10^{-9}$.

"Ophthalmically compatible", as used herein, refers to a material or surface of a material which may be in intimate contact with the ocular environment for an extended period of time without significantly damaging the ocular environment and without significant user discomfort.

The term "modulus" or "elastic modulus" in reference to a contact lens or a material means the tensile modulus or Young's modulus which is a measure of the stiffness of a contact lens or a material. A person skilled in the art knows well how to determine the elastic modulus of a silicone hydrogel material or a contact lens. For example, all commercial contact lenses have reported values of elastic modulus. It can be measured as described in Example 1.

"UVA" refers to radiation occurring at wavelengths between 315 and 380 nanometers; "UVB" refers to radiation occurring between 280 and 315 nanometers; "Violet" refers to radiation occurring at wavelengths between 380 and 440 nanometers.

"UVA transmittance" (or "UVA %T"), "UVB transmittance" or "UVB %T", and "violet-transmittance" or "Violet %T" are calculated by the following formula

$$\text{UVA \%T} = \frac{\text{Average \% Transmission between 315 nm and 380 nm}}{\text{Luminescence \%T}} \times 100$$

$$\text{UVB \%T} = \frac{\text{Average \% Transmission between 280 nm and 315 nm}}{\text{Luminescence \%T}} \times 100$$

$$\text{Violet \%T} = \frac{\text{Average \% Transmission between 380 nm and 440 nm}}{\text{Luminescence \%T}} \times 100$$

in which is Luminescence %T is determined by the following formula

Luminescence %T = Average % Transmission between 780-380 nm.

An "H-donor moiety" refers to a functional group which comprises a hydrogen atom capable of forming a hydrogen bond with another functional group. Examples of H-donor moieties include without limitation hydroxyl group, amide group of -CONHR $^0$, amide linkage of -CONH-, urethane linkage of -OCONH-, urea linkage of -HNCONH-, carboxyl group of -COOH, amino groups of -NHR $^0$, amino linkages of -NH-, and combinations thereof, wherein R° is H or a Ci-C $_4$ alkyl.

The term "inherently wettable" in reference to a silicone hydrogel contact lens means that the silicone hydrogel has water-break-up-time (WBUT) of about 10 seconds or more and a water contact angle by captive bubble ($WCA_{cb)}$ of about 80 degree or less without being subjected to any surface treatment after the silicone hydrogel contact lens is formed by thermally or actinically polymerizing (i.e., curing) a silicone hydrogel lens formulation. In accordance with the invention, WBUT and $WCA_{cb}$ are measured according to the procedures described in Example 1.

"Surface modification" or "surface treatment", as used herein, means that an article has been treated in a surface treatment process (or a surface modification process) prior to or posterior to the formation of the article, in which (1) a coating is applied to the surface of the article, (2) chemical species are adsorbed onto the surface of the article, (3) the chemical nature (e.g., electrostatic charge) of chemical groups on the surface of the article are altered, or (4) the surface properties of the article are otherwise modified. Exemplary surface treatment processes include, but are not limited to, a surface treatment by energy (e.g., a plasma, a static electrical charge, irradiation, or other energy source), chemical treatments, the grafting of hydrophilic vinylic monomers or macromers onto the surface of an article, mold-transfer coating process disclosed in U.S. Pat. No. 6719929, the incorporation of wetting agents into a lens formulation for making contact lenses proposed in U.S. Pat. Nos. 6367929 and 6822016, reinforced mold-transfer coating disclosed in U.S. Pat. No. 7858000, and a hydrophilic coating composed of covalent attachment or physical deposition of one or more layers of one or more hydrophilic polymer onto the surface of a contact lens disclosed in U.S. Pat. Nos. 8147897 and 8409599 and U.S. Pat. Appl. Pub. Nos. 2011-0134387 A1, 2012-0026457 A1 and 2013-0118127 A1.

"Post-curing surface treatment", in reference to a silicone hydrogel bulk material or a SiHy contact lens, means a surface treatment process that is performed after the silicone hydrogel bulk material or the SiHy contact lens is formed by curing (i.e., thermally or actinically polymerizing) a SiHy lens formulation. A "SiHy lens formulation" refers to a polymerizable composition that comprises all necessary polymerizable components for producing a SiHy contact lens or a SiHy lens bulk material as well known to a person skilled in the art.

The invention is generally related to inherently-wettable SiHy contact lenses with a relatively high oxygen permeability, a desired water content (e.g., from about 40% to about 70% by weight), and a relatively low elastic modulus (e.g., from about 0.2 MPa to about 1.5 MPa). This invention is partly based on the surprise discovery that inherently-wettable SiHy contact lenses can be formed from a SiHy lens formulation (i.e., a polymerizable composition) that comprises a polysiloxane vinylic crosslinker ("Di-PDMS") having H-donor moieties ("H-D"), a siloxane-containing vinylic monomer ("mono-PDMS") with or without H-donor moieties, a N-vinyl amide monomer ("NVA") (e.g., N-vinylpyrrolidone, N-vinyl-N-methyl acetamide, or the like), and optionally other silicone-containing polymerizable component(s) with or without H-donor moieties, provided that the SiHy lens formulation comprise about 8.8 mmoles or more of all N-vinyl amide monomer(s) ("NVA") per gram of all the silicone-containing polymerizable components (i.e., $\frac{[NVA] \text{ mmole}}{([\text{mono-PDMS}] + [\text{di-PDMS}]) \text{ g}} = Q.Q \text{ mmole/g}$) and about 0.11 miliequivalents ("meq") or more of the H-donor moieties per gram of all N-vinyl amide monomer(s) ((i.e., $\frac{[H\text{-}D] \text{ meq}}{[NVA] \text{ g}} = 0.11 \text{ meq/g}$)), which are contributed from the polysiloxane vinylic crosslinker and the siloxane-containing vinylic monomer, per gram of the N-vinyl amide monomer. The resultant SiHy lenses not only can be inherently wettable, but also can have a combination of the desired contact lens properties including relatively high oxygen permeability, relatively high water content, relatively low modulus, and relatively-low surface atomic Si percentage.

The invention, in one aspect, provides a silicone hydrogel contact lens, comprising a silicone hydrogel bulk material which comprises

(1) first repeating units of at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties,

(2) second repeating units of at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having one or more second H-donor moieties,

(3) third repeating units of at least one hydrophilic N-vinyl amide monomer,

(4) optionally fourth repeating units of at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties,

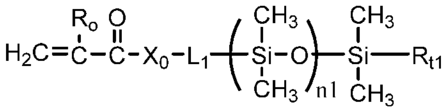
wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker,

wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of $-NHR^{0}$, amino linkages of -NH- , amide linkages of -CONH- , urethane linkages of -OCONH- , or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl,

wherein the silicone hydrogel bulk material comprises at least 8.8 (preferably at least 9.0, more preferably at least 9.2, even more preferably at least 9.6) mmoles of the third repeating units per gram of all the first, second and fourth repeating units in total and at least 0.11 (preferably at least 0.15, more preferably at least 0.20, even more preferably at least 0.25) meq of all the first, second and third H-donor moieties in total per gram of the third repeating units, wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers, an elastic modulus of from about 0.2 MPa to about 1.5 MPa, and an equilibrium water content of from about 40% to about 70% and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds (preferably at least 15 seconds, more preferably at least 20 seconds) and a water contact angle by captive bubble of about 80 degrees or less (preferably about 75 degrees or less, more preferably about 70 degrees or less, even more preferably about 65 degrees or less) without being subjected to any post-curing surface treatment.

In accordance with the invention, the amounts (weight, mmole, and meq) of the first, second, third and fourth repeating units as well as the H-donor moieties are calculated based on the amounts of said at least one siloxane-containing vinylic monomer, said at least one linear chain-extended polysiloxane vinylic crosslinker, said at least one N-vinyl amide monomer and said at least one polysiloxane vinylic crosslinker present in a polymerizable composition for making a silicone hydrogel contact lens of the invention. It should be understood that if any pre-formed homopolymer or copolymer of an N-vinyl amide monomer is present in the polymerizable composition prior to cast molding, then the repeating units of such an N-vinyl amide monomer in the preformed homopolymer or copolymer must not be included in the calculations of the amounts (weight, mmole, and meq) of the first, second, third and fourth repeating units as well as the H-donor moieties.

Any suitable siloxane-containing vinylic monomers can be used in the invention. One class of preferred siloxane containing vinylic monomers is mono-(meth)acryloyl-terminated, monoalkyl-terminated polysiloxanes. In a more preferred embodiment, the siloxane-containing vinylic monomer is a mono-(meth)acryloyl-terminated, monoalkyl-terminated polysiloxane of formula (I)

 (I)

in which:

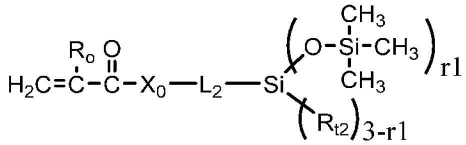
$R_0$ is H or methyl; $X_0$ is O or $NR_1$; $L_1$ is a $C_3$-$C_8$ alkylene divalent radical or a divalent radical of - $L_1$'- $X_1$- $L_1$"- , $-(C_2H_4O)_{q1}-L_1$"- , -(^O^CONH-L,-- ,

$-L_1$'-NHCOO-$(C_2H_4O)_{q1}$-$L_1$"- , -$CH_2$-CH(OH)-$CH_2$-$X_1$'-$(C_2H_4O)_{q2}$-$L_1$"- ,

$-L_1$'-$X_1$'- $CH_2$-CH(OH)-$CH_2$-O-$L_1$"- , or $-(C_2H_4O)_{q1}$-$CH_2$-CH(OH)-$CH_2$-O-$L_1$"- ; $L_1$' is a $C_2$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_1$" is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, CONR1 , or NR1CO; $R_1$ is H or a C1-C4 alkyl having 0 to 2 hydroxyl group; $R_{t1}$ is a C1-C4 alkyl; $X_1$' is O or NRi ; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; n1 is an integer of 3 to 25.

Examples of mono-(meth)acryloyl-terminated, monoalkyl-terminated polysiloxanes of formula (I) include without limitation a-(meth)acryloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloxy-2-hydroxypropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(2-hydroxyl-methacryloxypropyloxypropyl)-u-butyl-decamethylpentasiloxane, a-[3-(meth)acryloxyethoxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxy-propyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxyisopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxybutyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxyethylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxypropylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxybutyl-amino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloxy(polyethylenoxy)-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyloxy-ethoxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyl-N-ethylaminopropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyl-aminopropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyloxy-(polyethylenoxy)propyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloylamidopropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-N-methyl-(meth)acryloylamidopropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidoethoxy-2-hydroxypropyloxy-propyl]-terminated ω-butyl (or ω-methyl) polydimethylsiloxane, a-[3-(meth)acrylamidopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or u-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidoisopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidobutyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloylamido-2-hydroxypropyloxypropyl] terminated ω-butyl (or u-methyl) polydimethylsiloxane, a-[3-[N-methyl-(meth)acryloylamido]-2-hydroxypropyloxypropyl] terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, N-methyl-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, N-(2,3-dihydroxypropane)-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, (meth)acryloylamidopropyltetra(dimethylsiloxy)dimethylbutylsilane, and mixtures thereof. Mono-(meth)acryloyl-terminated , monoalkyl-terminated polysiloxanes of formula (I) can be obtained from commercial suppliers (e.g., Shin-Etsu, Gelest) or prepared according to procedures described in U.S. Pat. Appl. Pub. Nos. 6867245, 841 5405, 8475529, 861 4261 , and 921 781 3 or by reacting a hydroxyalkyl (meth)acrylate or (meth)acrylamide or a (meth)acryloxypolyethylene glycol with a mono-epoxypropyloxypropyl-terminated polydimethylsiloxane, by reacting glycidyl (meth)acrylate with a mono-carbinol-terminated polydimethylsiloxane, a mono-aminopropyl-terminated polydimethylsiloxane, or a mono-ethylaminopropyl-terminated polydimethylsiloxane, ob by reacting isocyanatoethyl (meth)acrylate with a mono-carbinol-terminated polydimethylsiloxane according to coupling reactions well known to a person skilled in the art.

Another class of preferred siloxane containing vinylic monomers is vinylic monomers containing a tris(trimethylsilyloxy)silyl or bis(trimethylsilyloxy)alkylsilyl group (i.e., tris(trimethylsilyloxy)silyl-containing vinylic monomer or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer. In a more preferred embodiment, the siloxane-containing vinylic monomer is a tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer of formula (II)




(II)

in which: $R_0$ is H or methyl; $X_0$ is O or NRi ; L2 is a C3-C8 alkylene divalent radical or a divalent radical of or -L2 '-X2-L2"-, -(C $_2H_4$0 $)_q$i-L2"-, -(C2H $_4$0 $)_q$i-CONH-L2"-; or - $L_2$'-NHCOO-(C2H $_4$0)qi-L2"-, $L_2$' is a $C_2$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_2''$ is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, **CONR1 ,** or **NR1CO;** $R_1$ is H or a $C_1$-$C_4$ alkyl having 0 to 2 hydroxyl group; $R_{t2}$ is a **C1-C4** alkyl; q1 is an integer of 1 to 20, r1 is an integer of 2 or 3.

Examples of preferred siloxane-containing vinylic monomers of formula (II) include without limitation tris(trimethylsilyloxy)silylpropyl (meth)acrylate, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)methylsilane, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)butylsilane, 3-(meth)acryloxy-2-(2-hydroxyethoxy)-propyloxy)propylbis(trimethylsiloxy)methylsilane, N-[tris(trimethylsiloxy)silylpropyl]-(meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl)-2-methyl (meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl) (meth)acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl)-2-methyl acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl) (meth)acrylamide, and mixtures thereof. Preferred siloxane-containing vinylic monomers of formula (II) can be obtained from commercial suppliers or can be prepared according to procedures described in U.S. Pat. Nos. 7214809, 8475529, 8658748, 9097840, 9103965, and 9475827.

In accordance with the present invention, the siloxane-containing vinylic monomer is a mono-(meth)acryloyl-terminated monoalkyl-terminated polysiloxane, a bis(trimethylsilyloxy)-alkylsilyl-containing vinylic monomer, tris(trimethylsilyloxy)silyl-containing vinylic monomer, or mixtures thereof, preferably a mono-(meth)acryloyl-terminated monoalkyl-terminated polysiloxane, a bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer or combinations thereof, more preferably a mono-(meth)acryloyl-terminated monoalkyl-terminated polysiloxane having a weight-average molecular weight of about 2500 Daltons or less (preferably about 2000 Daltons or less, more preferably about 1700 Daltons or less, even more preferably from about 450 to about 1500 Daltons) of formula (I), even more preferably more preferably a mono-(meth)acryloyl-terminated monoalkyl-terminated polysiloxane of formula (I) in which n1 is an integer of 3 to 25 (preferably 3 to 20, more preferably 3 to 15, even more preferably 3 to 10).

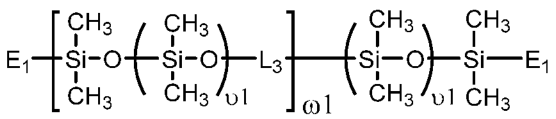
It is understood that by having at least one H-donor moiety, the siloxane-containing vinylic monomer can be more compatible with hydrophilic N-vinyl amide monomer compared to one without any H-donor moiety.

In accordance with the invention, any linear chain-extended polysiloxane vinylic crosslinker can be used in the invention, so long as it comprises at least two H-donor moieties and has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons (preferably from about 4000 to about 40000 Daltons, more preferably from about 5000 to about 20000 Daltons).

While not wishing to be bound by any theory, the inventors believe that such a linear chain-extended polysiloxane vinylic crosslinker play important roles in having high oxygen permeability and low modulus while maintaining the integrity of the contact lens during handling. Where a polysiloxane vinylic crosslinker without H-donor moieties or hydrophilic moieties has a number average molecular weight too low, the modulus of resultant SiHy lenses would be too high. However, where a polysiloxane vinylic crosslinker without H-donor moieties or hydrophilic moieties has a high number average molecular weight, it is not sufficiently compatible with N-vinyl amide monomer or other hydrophilic polymerizable component and could cause haziness to resultant SiHy contact lenses. With an adequate number of H-donor moieties and two or more relatively-low molecular weight polysiloxane segments, a high molecular weight chain-extended polysiloxane vinylic crosslinker would be sufficiently compatible with N-vinyl amide monomer and other hydrophilic polymerizable components. In addition, it is believed that due to the presence of those H-donor moieties, N-vinyl amide monomer molecules may be preferentially located in the vicinities of such a high molecular weight chain-extended polysiloxane vinylic crosslinker because of hydrogen bonding between N-vinyl amide monomer and the H-donor moieties. During the polymerization , in-situ generated poly(N-vinylamide) may preferentially form inter-penetrating network with hydrophobic silicone regions and would therefore facilitate the formation of a silicone hydrogel with a macroscopic homogeneity but a microscopic heterogeneity (i.e., microscopic phase separation) for having minimized haziness, high oxygen permeability and high water content.

Preferably, the linear chain-extended polysiloxane vinylic crosslinker has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and from 2 to 20 polysiloxane segments each pair of which are linked via an organic radical having at least two H-donor moieties selected from group consisting of urethane linkage of -OCONH- , hydroxyl groups, carboxyl groups, amino groups of -NHR°, amino linkages of -NH-, amide linkages of -CONH- , and combinations thereof, wherein the polysiloxane vinylic crosslinker.

In a preferred embodiment, the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (1)




(1)

in which:

υ1 is an integer of from 5 to 50 and ω1 is an integer of from 1 to 15; $L_3$ is a divalent radical of

-L3 '-0-{c2H 40)72-CONH-R2-(NHCO-PE-CONH-R2)7NHCO-{oC2H4)-0-L3 '- ; PE is a divalent radical of $-(CH_2CH_2O)_{q3}-Z_0-CF_2-(OCF_2)_x-(OCF_2CF_2)_y-OCF_2-Z_0-(OCH_2CH_2)_{q3}-$ or

$-Z_0-(CH_2CH_2O)_{q4}-(CH_2-CH(CH_3)-O)_{q5}-(CH_2-CH(C_2H_5)-O)_{q6}-Z_0-$ ; **$E_1$** is a monovalent radical of

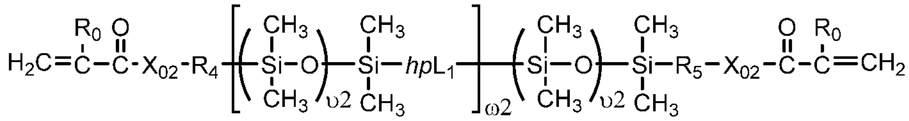
$H_2C=C(R_0)-C(=O)-X_{01}-L_4-$ ; $L_4$ is a divalent radical of $-C_2H_4-NHCO-O-(C_2H_4O)_{q2}-L_3'-$ ,

$-(C_2H_4O)_{q1}-CONH-R_2-NHCO-O-(C_2H_4O)_{q2}-L_3'-$ , $-R_3-O-CONH-R_2-NHCO-O-(C_2H_4O)_{q2}-L_3'-$ ,

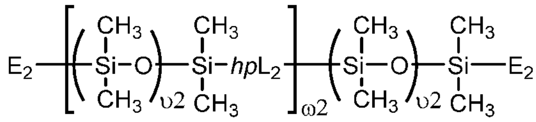
$-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{q2}-L_3'-$ , or $-(C_2H_4O)_{q2}-L_3'-$ ; $R_0$ is H or methyl; $X_{01}$ is O or $NR_{n1}$; $R_{n1}$ is H or a $C_1$-$C_{10}$ alkyl; $R_2$ is a $C_4$-$C_{14}$ hydrocarbon divalent radical; $R_3$ is a $C_2$-$C_6$ alkylene divalent radical; $L_3'$ is $C_3$-$C_8$ alkylene divalent radical; $Z_0$ is a direct bond or a $C_1$-$C_{12}$ alkylene divalent radical; g1 is 1 or zero; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; q3 is an integer of 0 to 2; q4 is an integer of 2 to 50, q5 and q6 independent of each other are a number of 0 to 35; provided that (q4+q5+q6) is an integer of 2 to 50; x+y is an integer of from 10 to 30.

Chain-extended polysiloxane vinylic crosslinkers of formula (1) can be prepared according to the procedure described in U.S. Pat. Nos. 5034461, 5416132, 5449729, 5760100, 7423074, and 8529057.

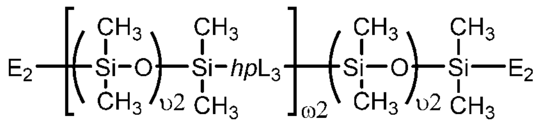
In another preferred embodiment, the chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (2), (3) or (4)



(2)



(3)



(4)

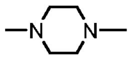
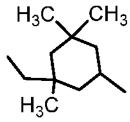
in which:

$hpL_1$ is a divalent radical of

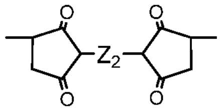
$-R_4-CH(R_0)-CH_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-Y-NR_{n2}-C(=O)-CH(NH-C(=O)-CH_3)-C_2H_4-S-CH_2-CH(R_0)-R_5-$ ;

$hpL_2$ is a divalent radical of $-R_4-NR_{n2}-C(=O)-CH(HN-C(=O)-CH_3)-C_2H_4-S-Y_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-R_5-$;

$hpL_3$ is a divalent radical of $-R_4-NR_{n2}-C(=O)-CH(NH-C(=O)-CH_3)-C_2H_4-S-Y_3-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-R_5-$;

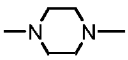
$Y_1$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, a divalent radical of , or a divalent radical of ;

$Y_2$ is a divalent radical of $-CH_2-CH(R_0)-C(=O)-Z_3-C(=O)-CH(R_0)-CH_2-$;

$Y_3$ is a divalent radical of $-CH_2-CH_2-S(=O)_2-(Z_1-S(=O)_2)_{m1}-CH_2-CH_2-$ or ;

$Z_1$ is a $C_1$-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical,

$Z_2$ is a $C_1$-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, a dihydroxyl- or dimethoxy-substituted $C_2$-$C_6$ alkylene divalent radical, a divalent radical of $-C_2H_4-(O-C_2H_4)_{m2}-$, a divalent radical of $-Z_4-S-S-Z_4-$, a hydroxyl- or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical,

$Z_3$ is a divalent radical of any one of (a) $-NR_{n3}-$, (b) , (c) $-NR_0-Z_5-NR_0-$, and (d) $-O-Z_6-O-$,

$Z_4$ is a $C_1$-$C_6$ alkylene divalent radical,

$Z_5$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical,

$Z_6$ is (a) a $C_1$-$C_6$ alkylene divalent radical, (b) a divalent radical of

$-(CH_2-CH(OH)-CH_2-O)_{m3}-CH_2-CH(OH)-CH_2-$, $-CH_2-CH(OH)-CH_2-O-CH_2-CH_2-O-CH_2-CH(OH)-CH_2-$,

$-(CH_2-CH_2-O)-CH_2-CH_2-$, $-(CH_2)_{m5}-O-P(O)(OH)-O-(CH_2)_{m5}-$, or (c) a substituted $C_3$-$C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group,

$Z_7$ is a divalent radical of $-Z_3-C(=O)-CH(R_0)-CH_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-R_4-$;

$Z_8$ is a divalent radical of -Z9 $-\overset{O}{\overset{\|}{C}}-\overset{R_0}{\overset{|}{C}H}-CH2-S-C2H4-\overset{H_3C-\overset{O}{\overset{\|}{C}}-NH}{\overset{|}{C}H}-\overset{O}{\overset{\|}{C}}-NR_{n2}-R_4-$

E2 is a monovalent radical of $H_2C=\overset{R_0}{\overset{|}{C}}-\overset{O}{\overset{\|}{C}}-Z_7-$,

$\upsilon 2$ is an integer of from 5 to 50; $\omega 2$ is an integer of from 1 to 15;

$X_{02}$ is O or $NR_{n2}$;

$R_0$ is hydrogen or methyl;

$R_{n2}$ and $R_{n3}$ independent of each other are hydrogen or Ci-$C_4$-alkyl;

$R_4$ and $R_5$ independent of each other are a Ci-$C_6$ alkylene divalent radical or a Ci-$C_6$ alkylene-oxy-Ci-$C_6$ alkylene divalent radical;

ml is 0 or 1, m2 is an integer of 1 to 6, m3 is 1 or 2, m4 is an integer of 1 to 5, m5 is 2 or 3.

A chain-extended polysiloxane vinylic crosslinker of formula (2) can be prepared in a 2-step reaction scheme. In the first step, a diamine can be reacted with N-acetylhomocysteine thiolactone to obtain a dithiol. In the second step, the dithiol can be reacted with a di-(meth)acryloyl-terminated polydiorganosiloxane according to Thiol Michael Addition reaction, to obtain a chain-extended polydiorganosiloxane vinylic crosslinker of the invention. It is understood that the molar equivalent ratio of dithiol to di-(meth)acryloyl-terminated polydiorganosiloxane should be less than 1 in order to obtained di-(meth)acryloyl-terminated chain-extended polydiorganosiloxane. A person skilled in the art knows how to control the number of polydiorganosiloxane segments in the resultant (meth)acryloyl-terminated chain-extended polydiorganosiloxane by varying the molar equivalent ratio of dithio to di-(meth)acryloyl-terminated polydiorganosiloxane.

A chain-extended polysiloxane vinylic crosslinker of formula (3) can be prepared in a 2-step reaction scheme . In the first step, a diamino-terminated polydiorganosiloxane can be reacted with N-acetylhomocysteine thiolactone to obtain a dithiol-terminated polydiorganosiloxane. In the second step, the dithiol-terminated polydiorganosiloxane can be reacted with a vinylic crosslinking agent having two (meth)acryloyl groups according to Thiol Michael Addition reaction, to obtain a chain-extended polydiorganosiloxane vinylic crosslinker of the invention. It is understood that the molar equivalent ratio of dithiol-terminated polydiorganosiloxane to vinylic crosslinking agent should be less than 1 in order to obtained di-(meth)acryloyl-terminated chain-extended polydiorganosiloxane. A person skilled in the art knows how to control the number of polydiorganosiloxane segments in the resultant (meth)acryloyl-terminated chain-extended polydiorganosiloxane by varying the molar equivalent ratio of dithio-terminated polydiorganosiloxane to vinylic crosslinking agent.

A chain-extended polysiloxane vinylic crosslinker of formula (4) can be prepared in a

3-step reaction scheme. In the first step, a diamino-terminated polysiloxane can be reacted with N-acetylhomocysteine thiolactone to obtain a dithiol-terminated polydiorganosiloxane. In the second step, the dithiol-terminated polydiorganosiloxane can be reacted with a divinylsulfone compound (i.e., a sulfone compound having two vinylsulfonyl groups) or with a dimaleimide according to Thiol Michael Addition reaction, to obtain a dithiol-terminated chain-extended polydiorganosiloxane having said one or more linkages. It is understood that the molar equivalent ratio of dithiol-terminated polydiorganosiloxane to divinylsulfone (or dimaleimide) should be great than 1 in order to obtained dithiol-terminated chain-extended polydiorganosiloxane. A person skilled in the art knows how to control the number of polydiorganosiloxane segments in the resultant chain-extended polydiorganosiloxane by varying the molar equivalent ratio of dithio-terminated polydiorganosiloxane to divinylsulfone (or dimaleimide). In the third step, the dithiol-terminated chain-extended polydiorganosiloxane can be reacted with a vinylic crosslinking agent having two (meth)acryloyl groups according to Thiol Michael Addition reaction, to obtain a chain-extended polydiorganosiloxane vinylic crosslinker of the invention.

Any suitable polysiloxanes having two terminal amino groups can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (2), (3) or **(4).** Various polysiloxanes having two terminal amino groups (—NHR') can be obtained from commercial suppliers (e.g., from Gelest, Inc, Shin-Etsu, or Fluorochem). Otherwise, one skilled in the art will know how to prepare such diamino-terminated polydiorganosiloxanes according to procedures known in the art and described in Journal of Polymer Science - Chemistry, 33, 1773 (1995).

Any divinylsulfone compounds can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (2), (3) or **(4).** Examples of preferred divinylsulfone ocmpounds include without limitation divinyl sulfone, bis(vinylsulfonyl) $C_1$-$C_6$ alkane, 1,3-bis(vinylsulfonyl)-2-propanol, 1,1-bis(vinylsulfonyl)-1 -propanol, 1,5-bis(vinylsulfonyl)-3-pentanol, 1,1-bis(vinylsulfonyl)-3-methoxypropane, 1,5-bis(vinylsulfonyl)-2 ,4-dimethylbenzene, and 1,4-bis(vinylsulfonyl)-2,3,5,6-tetrafluorobenzene.

Any dimaleimides can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (2), (3) or **(4).** Examples of preferred dimaleimides include without limitation 1,8-bismaleimido-diethyleneglycol, 1,11-bismaleimido-triethyleneglycol, dithio-bis-maleimidoethane, $\alpha,\omega$-bismaleimido $C_1$-$C_6$ alkane, 1,2-dihydroxyl-1 ,2-bismaleimidoethane, 1,4-bismaleimido-2,3-dihydroxybutane, N,N'-(1 ,3-Phenylene)dimaleimide.

Any hydrophilic vinylic crosslinking agents having two (meth)acryloyl groups can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (2), (3) or **(4).** Examples of preferred hydrophilic vinylic crosslinking agents include without limitation diacrylamide (i.e., N-(1 -oxo-2-propenyl)-2-propenamide), dimethacrylamide (i.e., N-(1 -oxo-2-methyl-2-propenyl)-2-methyl-2-propenamide), N,N-di(meth)acryloyl-N-methylamine, N,N-di(meth)acryloyl-N-ethylamine, N,N'-methylene bis(meth)acrylamide, N,N'-ethylene bis(meth)acrylamide, N,N'-dihydroxyethylene bis(meth)acrylamide, N,N'-propylene bis(meth)acrylamide, N,N'-2-hydroxypropylene bis(meth)acrylamide, N,N'-2,3-dihydroxybutylene bis(meth)acrylamide, 1,3-bis(meth)acrylamidepropane-2-yl dihydrogen phosphate (i.e., N,N'-2-phosphonyloxypropylene bis(meth)acrylamide), piperazine diacrylamide (or 1,4-bis(meth)acryloyl piperazine), ethyleneglycol di-(meth)acrylate, diethyleneglycol di-(meth)acrylate, triethyleneglycol di-(meth)acrylate, tetraethyleneglycol di-(meth)acrylate, glycerol di-(meth)acrylate, 1,3-propanediol di-(meth)acrylate, 1,3-butanediol di-(meth)acrylate, 1,4-butanediol di-(meth)acrylate, glycerol 1,3-diglycerolate di-(meth)acrylate, ethylenebis[oxy(2-hydroxypropane-1 ,3-diyl)] di-(meth)acrylate, bis[2-(meth)acryloxyethyl] phosphate, trimethylolpropane di-(meth)acrylate, and 3,4-bis[(meth)acryloyl]tetrahydrofuan .

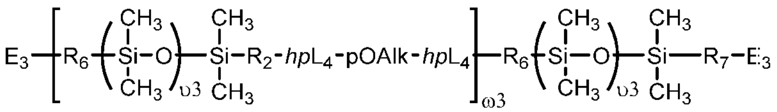
Any diamines can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (2), (3) or (4). Examples of preferred diamines include without limitation 1,3-diamino-2-propanol, 1,2-diaminoethane-1 ,2-diol, 1,1-diaminoethane-1 ,2-diol, 1,4-diamino-2,3-butanediol, ethylenediamine, N,N'-dimethyl-1 ,3-propanediamine, N,N'-diethyl-1 ,3-propanediamine, 1,3-propanediamine, 1,4-butanediamine, 1,5-pentanediamine, 2,2-dimethyl-1 ,3-propanediamine, hexamethylenediamine, and isophoronediamine (3-aminomethyl-3,5,5-trimethylcyclohexylamine).

Any di-(meth)acryloyl-terminated polysiloxanes can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (2), (3) or (4). Examples of preferred di-(meth)acryloyl-terminated polydiorganosiloxanes include without limitation α,ω-bis[3-(meth)acrylamidopropyl]-terminated polydimethylsiloxane, a,u>bis[3-(meth)acryloxypropyl]-terminated polydimethylsiloxane, a,u>bis[3-(meth)acryloxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u>bis[3-(meth)acryloxyethoxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u>bis[3-(meth)acryloxypropyloxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, α,ω-bis[3-(meth)acryloxyisopropyloxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[3-(meth)acryloxybutyloxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[3-(meth)acrylamidoethoxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u>bis[3-(meth)acrylamidopropyloxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[3-(meth)acrylamidoisopropyloxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[3-(meth)acrylamidobutyloxy-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[3-(meth)acryloxyethylamino-2-

hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u>bis[3-(meth)acryloxypropylamino-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[3-(meth)acryloxybutylamino-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[(meth)acrylamidoethylamino-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[3-(meth)acrylamidopropylamino-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u>bis[3-(meth)acrylamidobutylamino-2-hydroxypropyloxypropyl]-terminated polydimethylsiloxane, a,u-bis[(meth)acryloxy-2-hydroxypropyloxy-ethoxypropyl]-terminated polydimethylsiloxane, a,u-bis[(meth)acryloxy-2-hydroxypropyl-N-ethylaminopropyl]-terminated polydimethylsiloxane, a,u-bis[(meth)acryloxy-2-hydroxypropyl-aminopropyl]-polydimethylsiloxane, a,u-bis[(meth)acryloxy-2-hydroxypropyloxy(polyethylenoxy)propyl]-terminated polydimethylsiloxane, a,u-bis[(meth)acryloxyethylaminocarbonyloxy-ethoxypropyl]-terminated polydimethylsiloxane, α,ω-bis[(meth)acryloxyethylaminocarbonyloxy-(polyethylenoxy)propyl]-terminated polydimethylsiloxane.

The procedures for preparing chain-extended polysiloxane vinylic crosslinkers of formula (2), (3) or (4) has been described in detail in U.S. Pat. App. Pub. No. 2018-0100053 A1.

In another preferred embodiment, the chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula formula (5)



(5)

in which:

$\upsilon 3$ is an integer of from 5 to 50; $\omega 3$ is an integer of from 1 to 15;

E3 is a monovalent radical of $H_2C{=}C(R_0)-C(=O)-X_{03}-$ in which $R_0$ is hydrogen or methyl, $X_{03}$ is O or $NR_{n4}$, and $R_{n4}$ is hydrogen or $C_1$-$C_4$-alkyl;

$R_6$ and $R_7$ independent of each other are a $C_1$-$C_6$ alkylene divalent radical or a $C_1$-$C_6$ alkoxy-$C_1$-$C_6$ alkylene divalent radical;

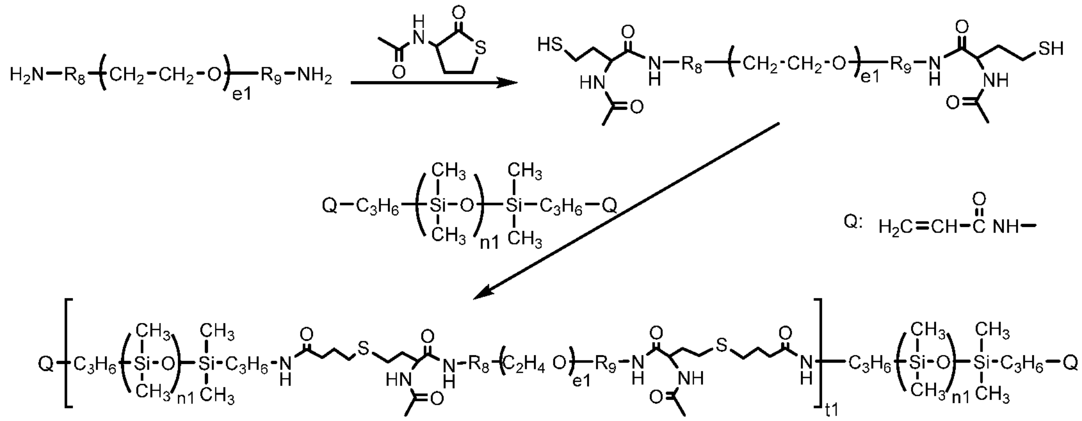
pOAlk is a divalent radical of $-(EO)_{e1}(PO)_{p1}(BO)_{b1}-$ in which EO is an oxyethylene unit (-CH2CH2O-), PO is an oxypropylene unit ($-CH_2-CH(CH_3)-O-$), and BO is an oxybutylene unit ($-CH_2-CH(C_2H_5)-O-$), e1 is an integer of 5 to 100, p1 and b1 independent of each other are an integer of 0 to 50, provided that (e1+p1+b1)>10 and $e1/(p1+b1) \geq 2$ (preferably from about 2:1 to about 10:1, more preferably from about 3:1 to about 6:1) when $(p1+b1)>1$;

$hpL_4$ is a divalent radical of $-X_{03}-\overset{O}{\overset{\|}{C}}-\overset{R_0}{\overset{|}{C}H}-CH_2-S-C_2H_4-\overset{H_3C-\overset{O}{\overset{\|}{C}}-NH}{\overset{|}{C}H}-\overset{O}{\overset{\|}{C}}-NR_{n4}-R_8-$ or

$-R_9-NR_{n4}-\overset{O}{\overset{\|}{C}}-\overset{HN-\overset{O}{\overset{\|}{C}}-CH_3}{\overset{|}{C}H}-C_2H_4-S-CH_2-\overset{R_0}{\overset{|}{C}H}-\overset{O}{\overset{\|}{C}}-X_{03}-$ in which $R_8$ and $R_9$ independent of each other are a substituted or unsubstituted C1-C12 alkylene divalent radical.

A chain-extended polysiloxane vinylic crosslinker of formula (5) can be prepared in a 2-step reaction scheme. In the first step, a diamino-terminated polyoxyalkylene can be reacted with N-acetylhomocysteine thiolactone to obtain a dithiol-terminated polyoxyalkylene. In the second step, the dithiol-terminated polyoxyalkylene can be reacted with a di-(meth)acryloyl-terminated polydimethylsiloxane according to Thiol Michael Addition reaction, to obtain a polymerizable polydimethylsiloxane-polyoxyalkylene block copolymer of formula (5). It is understood that the molar equivalent ratio of dithiol-terminated polyoxyalkylene to di-(meth)acryloyl-terminated polydimethylsiloxane should be less than 1 in order to obtained di-(meth)acryloyl-terminated polydimethylsiloxane-polyoxyalkylene block copolymer. A person skilled in the art knows how to control the number of polydimethylsiloxane segments in the resultant (meth)acryloyl-terminated polydimethylsiloxane-polyoxyalkylene block copolymer by varying the molar equivalent ratio of dithiol-terminated polyoxyalkylene to di-(meth)acryloyl-terminated polydimethylsiloxane.

As an illustrative example, Scheme 1 shows how to prepare a polymerizable polymerizable polydimethylsiloxane-polyoxyalkylene block copolymer of formula (5) from diaminoalkyl-terminated polyoxyethylene ($H_2N-R_3-(EO)_{e1}-R_4-NH_2$), N-acetylhomocysteine thiolactone, and diacrylamido-terminated polydimethylsiloxane. It is understood that the diaminoalkyl-terminated polyoxyethylene can be replaced by a diaminoalkyl-terminated polyoxyethylene-polyoxypropylene di- or tri-block copolymer or a diaminoalkyl-terminated polyoxyethylene-polyoxybutylene di- or tri-block copolymer, and/or that the diacrylamido-terminated polydimethylsiloxane can be replaced by a dimethacrylamido-terminated polydimethylsiloxane or a di-(meth)acryloyloxy-terminated polydimethylsiloxane, to obtain a polymerizable polydimethylsiloxane-polyoxyalkylene block copolymer of formula (5).



**Scheme 1**

Any di-(meth)acryloyl-terminated polydimethylsiloxanes can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (5). Examples of preferred di-(meth)acryloyl-terminated polydimethylsiloxanes are described above.

Any diamino-terminated polyoxyethylenes, diamino-terminated polypolyoxyethylene-polyoxypropylene di-block copolymers, diamino-terminated polypolyoxyethylene-polyoxypropylene tri-block copolymers, diamino-terminated polypolyoxyethylene-polyoxybutylene di-block copolymers, diamino-terminated polypolyoxyethylene-polyoxybutylene tri-block copolymers can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (5). They can be obtained from commercial sources. Alternatively, they can be prepared from dihydroxy-terminated polyoxyalkylene according to methods known to a person skilled in the art, e.g., those described in U.S. Pat. Nos. 4179337 and 5206344, U.S. Pat. Appl. Pub. No. 20030149307, and in the papers published by De Vos and Goethals (Makromol. Chem., Rapid Commun. 6, 53-56 (1985)) and by Buckmann et al. (Biotechnology and Applied Biochemistry 9, 258-268 (1987)).

The dihydroxy-teminated polypolyoxyethylene-polyoxybutylene block copolymers may be synthesized according to procedures described in U.S. Pat. No. 8318144.

In accordance with the invention, diamino-terminated polyoxyakylene utilized in the present invention have a molecular weight in the range of preferably from 250 to about 50,000 Daltons; and more preferably from about 500 to about 10,000 Daltons.

The procedures for preparing chain-extended polysiloxane vinylic crosslinkers of formula (5) have been described in detail in U.S. Pat. App. Pub. No. 2018-0100038 A1.

In accordance with the invention, the chain-extended polysiloxane vinylic crosslinker is preferably defined by formula (6)

$$E_4-\left[\left(\underset{CH_3}{\overset{CH_3}{|}}\!\!\!\!Si-O\right)_{\upsilon 4}\!\!-\underset{CH_3}{\overset{CH_3}{|}}\!\!\!\!Si-G_1-CH_2-\overset{R_0}{\overset{|}{C}}H-S-J_0-S-\overset{R_0}{\overset{|}{C}}H-CH_2-G_1\right]_{\omega 4}\!\!-\left(\underset{CH_3}{\overset{CH_3}{|}}\!\!\!\!Si-O\right)_{\upsilon 4}\!\!-\underset{CH_3}{\overset{CH_3}{|}}\!\!\!\!Si-E_4 \qquad (6)$$

in which

**v4** is an integer from **5** to **100;** **ω4** is an integer of **1** to **15;**

$R_0$ is hydrogen or methyl;

$J_0$ is a C1-C12 hydrocarbon radical having **0** to **2** hydroxyl or carboxyl groups;

**G1** is a direct bond, a C1-C4 alkylene divalent radical, or a bivalent radical of

$-X_{04}-(C_2H_4O)_{h1}-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$ ,

-Xos-Ma-O-CONH-M^NHCO-O^Cz^O^Mo- , $-X_{06}-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-$ ,

$-X_{07}-(C_2H_4O)_{h2}-M_0-$ ; $-X_{08}-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-$ ,

$-X_{10}-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h2}-M_0-$ , $-X_{07}-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-$ , or

$-X_{08}-(C_2H_4O)_{h1}-CH_2-CH(OH)-CH_2-O-M_0-$ in which h1 is an integer of **1** to **20;** **h2** is an integer of **0** to **20;** $M_0$ is $C_3$-$C_8$ alkylene divalent radical; $M_1$ is a C4-C14 hydrocarbon divalent radical; $M_2$ and $M_3$ independent of each other are a $C_1$-$C_6$ alkylene divalent radical; $X_{04}$ is -COO- or -CONRns-; Rns is H or a C1-C10 alkyl; $X_{05}$ and $X_{07}$ independent of each other are a direct bond, -COO- or -CONRns-; $X_{06}$ is a direct bond, a $C_1$-$C_6$ alkylene divalent radical, a $C_1$-$C_6$ alkylenoxy divalent radical, -COO-, or -CONRns-; $X_{08}$ is a direct bond or -COO-; $X_{09}$ is O or $NR_{ns}$; X10 is a direct bond, a $C_1$-$C_6$ alkylene divalent radical, -COO-, or -CONRns-; Provided that $M_0$ is linked to Si atom while $X_{04}$ to X10 are linked to the group of $-CH_2-$ in formula **(6)** and that at least one of $J_1$ and **G1** comprises at least one moieties selected from the group consisting of hydroxyl groups, urethane linkage of -OCONH-, amino groups of $-NHR^0$, amino linkages of -NH-, amide linkages of -CONH-, carboxyl groups, and combinations thereof;

$E_4$ is a monovalent radical of $H_2C{=}C(R_0)-C(=O)-X_{11}-G_2-$ or $H_2C{=}C(R_0)-C(=O)-G_3-$;

$X_{11}$ is O or $NR_{n5}$;

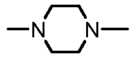
$G_2$ is a $C_1$-$C_4$ alkylene divalent radical or a bivalent radical of

$-(C_2H_4O)_{h1}-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$ , $-M_2-O-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$ ,

$-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-$ , $-(C_2H_4O)_{h2}-M_0-$ ; $-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-$ ,

$-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h2}-M_0-$ , $-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-$ , or

$-(C_2H_4O)_{h1}-CH_2-CH(OH)-CH_2-O-M_0-$ ;

$G_3$ is a divalent radical of $-G_4-(C(=O))_{h3}-CH(R_0)-CH_2-S-J_0-S-CH_2-CH(R_0)-(C(=O))_{h4}-G_2-$ in which h3 and h4 independent of each other are 1 or 0, G4 is a divalent radical of any one of (a) $-NR_3-$ in which $R_3$ is hydrogen or $C_1$-$C_3$ alkyl, (b)  , (c) $-NR''-G_5-NR''-$ in which R'' is hydrogen or methyl and $G_5$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical, and (d) $-O-G_6-O-$ in which $G_6$ is a $C_1$-$C_6$ alkylene divalent radical, a divalent radical of

$-(CH_2-CH(OH)-CH_2-O)_{h4}-CH_2-CH(OH)-CH_2-$ in which h4 is 1 or 2, a divalent radical of

$-CH_2-CH(OH)-CH_2-O-CH_2-CH_2-O-CH_2-CH(OH)-CH_2-$ , a divalent radical of

$-(CH_2-CH_2-O)_{h5}-CH_2-CH_2-$ in which h5 is an integer of 1 to 5, a divalent radical of

$-(CH_2)_{h6}-O-P(=O)(OH)-O-(CH_2)_{m5}-$ in which h6 is 2 or 3, or a substituted $C_3$-$C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group.

In accordance with the invention, a chain-extended polysiloxane vinylic crosslinker of formula (6) can be obtained by reacting at least one polysiloxane vinylic crosslinker (i.e., having one sole polysiloxane segment and two ethylenically-unsaturated groups) with at least one dimercaptan (i.e., a compound having two thiol groups), under Michael Addition or thiol-ene reaction conditions, provided that at least one of the dimercaptan and the polysiloxane vinyl crosslinker comprise at least one, preferably at least two, hydrophilic groups selected from the group consisting of hydroxyl groups, urethane linkage of -OCONH-, amino groups of $-NHR^0$, amino linkages of -NH- , amide linkages of -CONH- , carboxyl groups, and combinations thereof.

A chain-extended polysiloxane vinylic crosslinker of formula (6) can be prepared in a one-pot reaction . For example, a polysiloxane vinylic crosslinker can react with a dimercaptan under Michael Addition or thiol-ene reaction conditions at a molar equivalent ratio of about 2:1 to form a chain-extended polysiloxane vinylic crosslinker having two polysiloxane segments linked together through an organic linker including a dioether linakge derived from the dimercaptan .

Alternatively, steps-wise reactions can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (6). For example, in the first step, a dimercaptan can be reacted with a polysiloxane vinylic crosslinker under the Michael Addition or thio-ene reaction conditions at a molar equivalent ratio of about 2:1 or higher to form a thiol-capped polysiloxane having one sole polysiloxane segment (or a thiol-capped chain extended polysiloxane having two polysiloxane segments). In the second step, a polysiloxane vinylic crosslinker can react with the resultant thiol-capped polysiloxane under the Michael Addition or thio-ene reaction conditions at a molar equivalent ratio of about 2:1 or higher to form a chain-extended polysiloxane vinylic crosslinker of formula (6) having three (or two) polysiloxane segments. Addition step(s) of reactions can be used to add additional polysiloxane segments in a chain-extended polysiloxane vinylic crosslinker of formula (6).

In another alternatively process, steps-wise reactions can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (6). In the first step, a dimercaptan can be reacted with a polysiloxane vinylic crosslinker under the Michael Addition or thio-ene reaction conditions at a molar equivalent ratio sufficient to form a thiol-capped chain extended polysiloxane having at least two polysiloxane segments. In the second step, a non-silicone vinylic crosslinking agent can react with the resultant thiol-capped chain extended polysiloxane under the Michael Addition or thio-ene reaction conditions at a molar equivalent ratio of about 2:1 or higher to form a chain-extended polysiloxane vinylic crosslinker of formula (6).

Any polysiloxane vinylic crosslinker having one sole polysiloxane segment can be used in the invention to prepare a chain-extended polysiloxane vinyl crosslinker of formula (6). Preferred polysiloxane vinylic crosslinkers having one sole polysiloxane segment are described above.

Any dimercaptans having 2 to 24 carbon atoms can be used in the invention to prepare a chain-extended polysiloxane vinylic crosslinker of formula (6). Examples of preferred dimercaptans include without limitation $C_2$-$C_{12}$ alkyl dimercaptans (e.g., ethyl dimercaptan , propyl dimercaptan, butyl dimercaptan, pentamethylen dimercaptan, hexamethylene dimercaptan , heptamethylene dimercaptan, octamethylen dimercaptan , nonamethylene dimercaptan, decamethylene dimercaptan, or combinations thereof), ethylcyclohexyl dimercaptan, dipentene dimercaptan, benzenedithiol, methyl-substituted benzenedithiol, benzenedimethanethiol, glycol dimercaptoacetate, ethyl ether dimercaptan (diglycol dimercaptan), triglycol dimercaptan, tetraglycol dimercaptan, dimercaprol, dimercaptopropanol, dimercaptobutanol, dimercaptopentanol, dimercaptopropionic acid, dihydrolipoic acid, dithiothreitol, dimercaptosuccinic acid, and combinations thereof.

Any non-silicone vinylic crosslinking agent can be used in the preparation of a chain-extended polysiloxane vinylic crosslinker of formula (6). Examples of preferred non-silicone vinylic crosslinking agents include without limitation allylmethacrylate, allylacrylate, N-allyl-methacrylamide, N-allyl-acrylamide, diacrylamide, dimethacrylamide, N,N-di(meth)acryloyl-N-methylamine, N,N-di(meth)acryloyl-N-ethylamine, N,N'-methylene bis(meth)acrylamide, N,N'-ethylene bis(meth)acrylamide, N,N'-dihydroxyethylene bis(meth)acrylamide, N,N'-propylene bis(meth)acrylamide, N,N'-2-hydroxypropylene bis(meth)acrylamide, N,N'-2,3-

dihydroxybutylene bis(meth)acrylamide, 1,3-bis(meth)acrylamidepropane-2-yl dihydrogen phosphate, piperazine diacrylamide, ethyleneglycol di-(meth)acrylate, diethyleneglycol di-(meth)acrylate, triethyleneglycol di-(meth)acrylate, tetraethyleneglycol di-(meth)acrylate, glycerol di-(meth)acrylate, 1,3-propanediol di-(meth)acrylate, 1,3-butanediol di-(meth)acrylate, 1,4-butanediol di-(meth)acrylate, glycerol 1,3-diglycerolate di-(meth)acrylate, ethylenebis[oxy(2-hydroxypropane-1 ,3-diyl)] di-(meth)acrylate, bis[2-(meth)acryloxyethyl] phosphate, trimethylolpropane di-(meth)acrylate, and 3,4-bis[(meth)acryloyl]tetrahydrofuan .

Chain-extended polysiloxane vinylic crosslinkers of formula (6) can be prepared according to the procedure described in U.S. Pat. No. 8993651 .

It is understood that the fourth repeating units of at least one polysiloxane vinylic crosslinkers are optional components. Any suitable polysiloxane vinylic crosslinkers other than those chain-extended polysiloxane vinylic crosslinkers described above can be used in the inventions, so long as each of them comprises at least one polysiloxane segment and at least two ethylenically unsaturated groups. Examples of such polysiloxane vinylic crosslinkers are di(meth)acrylated polydimethylsiloxanes of various molecular weight (examples of those preferred di(meth)acrylated polydimethylsiloxanes are described above); divinylcarbamate-terminated polydimethylsiloxane; divinylcarbonate-terminated polydimethylsiloxanes; divinyl terminated polydimethylsiloxanes of various molecular weight; di(meth)acrylamide-terminated polydimethylsiloxanes (examples of those preferred di(meth)acrylamide-terminated polydimethylsiloxanes are described above); bis-3-methacryloxy-2-hydroxypropyloxypropyl polydimethylsiloxane; N,N,N',N'-tetrakis(3-methacryloxy-2-hydroxypropyl)-alpha,omega-bis-3-aminopropyl-polydimethylsiloxane; polysiloxane vinylic crosslikers each having hydrophilized siloxane units as described in U.S. Pat. App. Pub. No. 2017-0166673 A1; siloxane-containing macromer selected from the group consisting of Macromer A, Macromer B, Macromer C, and Macromer D described in U.S. Pat. No. 5760100; the reaction products of glycidyl methacrylate with amino-functional polydimethylsiloxanes; polysiloxane-containing macromers disclosed in U.S. Pat. Nos. 4136250, 4153641, 4182822, 4189546, 4343927, 4254248, 4355147, 4276402, 4327203, 4341889, 4486577, 4543398, 4605712, 4661575, 4684538, 4703097, 4833218, 4837289, 4954586, 4954587, 5010141, 5034461, 5070170, 5079319, 5039761, 5346946, 5358995, 5387632, 5416132, 5451617, 5486579, 5962548, 5981675, 6039913, and 6762264; polysiloxane-containing macromers disclosed in U.S. Pat. Nos. 4259467, 4260725, and 4261875.

In accordance with the invention, any suitable N-vinyl amide monomers can be used in the invention. Examples of preferred N-vinyl amide monomers include without limitation N-vinylpyrrolidone, N-vinyl piperidone, N-vinyl caprolactam, N-vinyl-N-methyl acetamide, N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, N-vinyl-N-ethyl acetamide, N-vinyl-N-ethyl formamide, and mixtures thereof. Preferably, the N-vinyl amide monomer is N-vinylpyrrolidone, N-vinyl-N-methyl acetamide, or combinations thereof.

In accordance with the invention, a silicone hydrogel contact lens of the invention can further comprise (but preferably comprises) repeating units of one or more non-silicone vinylic crosslinking agents, preferably in an amount of about 1.0% or less (preferably about 0.8% or less, more preferably from about 0.05% to about 0.6%) by weight relative to the dry weight of the silicone hydrogel contact lens. The amount of the repeating units of a non-silicone vinylic crosslinking agent can be calculated based on the amount of the non-silicone vinylic crosslinking agent in a polymerizable composition used for preparing the silicone hydrogel contact lens over the total amount of all polymerizable components in the polymerizable composition.

Examples of preferred non-silicone vinylic cross-linking agents include without limitation ethyleneglycol di-(meth)acrylate, diethyleneglycol di-(meth)acrylate, triethyleneglycol di-(meth)acrylate, tetraethyleneglycol di-(meth)acrylate, glycerol di-(meth)acrylate, 1,3-propanediol di-(meth)acrylate, 1,3-butanediol di-(meth)acrylate, 1,4-butanediol di-(meth)acrylate, glycerol 1,3-diglycerolate di-(meth)acrylate, ethylenebis[oxy(2-hydroxypropane-1 ,3-diyl)] di-(meth)acrylate, bis[2-(meth)acryloxyethyl] phosphate, trimethylolpropane di-(meth)acrylate, and 3,4-bis[(meth)acryloyl]tetrahydrofuan, diacrylamide, dimethacrylamide, N,N-di(meth)acryloyl-N-methylamine, N,N-di(meth)acryloyl-N-ethylamine, N,N'-methylene bis(meth)acrylamide, N,N'-ethylene bis(meth)acrylamide, N,N'-dihydroxyethylene bis(meth)acrylamide, N,N'-propylene bis(meth)acrylamide, N,N'-2-hydroxypropylene bis(meth)acrylamide, N,N'-2,3-dihydroxybutylene bis(meth)acrylamide, 1,3-bis(meth)acrylamidepropane-2-yl dihydrogen phosphate, piperazine diacrylamide, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, triallyl cyanurate, trimethylopropane trimethacrylate, pentaerythritol tetramethacrylate, bisphenol A dimethacrylate, and combinations thereof. A preferred non-silicone vinylic cross-linking agent is tetra(ethyleneglycol) di-(meth)acrylate, tri(ethyleneglycol) di-(meth)acrylate, ethyleneglycol di-(meth)acrylate, di(ethyleneglycol) di-(meth)acrylate, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, or triallyl cyanurate.

In accordance with the invention, a silicone hydrogel contact lens of the invention can further comprise (but preferably comprises) repeating units of one or more blending vinylic monomers, preferably in an amunt of about 25% or less by weight (preferably about 20% or less by weight, more preferably about 15% or less by weight, relative to the dry weight of the silicone hydrogel contact lens. The amount of the repeating units of a blending vinylic monomer can be calculated based on the amount of the blending vinylic monomer in a polymerizable composition used for preparing the silicone hydrogel contact lens over the total amount of all polymerizable components in the polymerizable composition.

Examples of preferred blending vinylic monomers include C1-C10 alkyl (meth)acrylate (e.g., methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, isopropyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, pentyl (meth)acrylate, hexyl (meth)acrylate, etc.), cyclopentylacrylate, cyclohexylmethacrylate, cyclohexylacrylate, isobornyl (meth)acrylate, styrene, 4,6-trimethylstyrene (TMS), t-butyl styrene (TBS), trifluoroethyl (meth)acrylate, hexafluoro-isopropyl (meth)acrylate, hexafluorobutyl (meth)acrylate, or combinations thereof. Preferably, methyl methacrylate is used as a blending vinylic monomer.

In accordance with a preferred embodiment of the invention, a silicone hydrogel contact lens of the invention can further comprise (but preferably comprises) repeating units of one or more UV-absorbing vinylic monomers and optionally (but preferably) one or more UV/HEVL-absorbing vinylic monomers. The term "UV/HEVL-absorbing vinylic monomer" refers to a vinylic monomer that can absorbs UV light and high-energy-violet-light (i.e., light having wavelength between 380 nm and 440 nm.

Any suitable UV-absorbing vinylic monomers and UV/HEVL-absorbing vinylic monomers can be used in a polymerizable composition for preparing a polymer of the invention. Examples of preferred UV-absorbing and UV/HEVL-absorbing vinylic monomers include without limitation: 2-(2-hydroxy-5-vinylphenyl)-2H-benzotriazole, 2-(2-hydroxy-5-acrylyloxyphenyl)-2H-benzotriazole, 2-(2-hydroxy-3-methacrylamido methyl-5-tert octylphenyl) benzotriazole, 2-(2'-hydroxy-5'-methacrylamidophenyl)-5-chlorobenzotriazole, 2-(2'-hydroxy-5'-methacrylamidophenyl)-5-methoxybenzotriazole, 2-(2'-hydroxy-5'-methacryloxypropyl-3'-t-butyl-phenyl)-5-chlorobenzotriazole, 2-(2'-hydroxy-5'-methacryloxypropylphenyl) benzotriazole, 2-hydroxy-5-methoxy-3-(5-(trifluoromethyl)-2H-benzo[d][1 ,2,3]triazol-2-yl)benzyl methacrylate (WL-1), 2-hydroxy-5-methoxy-3-(5-methoxy-2H-benzo[d][1 ,2,3]triazol-2-yl)benzyl methacrylate (WL-5), 3-(5-fluoro-2H-benzo[d][1 ,2,3]triazol-2-yl)-2-hydroxy-5-methoxybenzyl methacrylate (WL-2), 3-(2H-benzo[d][1 ,2,3]triazol-2-yl)-2-hydroxy-5-methoxybenzyl methacrylate (WL-3), 3-(5-chloro-2H-benzo[d][1 ,2,3]triazol-2-yl)-2-hydroxy-5-methoxybenzyl methacrylate (WL-4), 2-hydroxy-5-methoxy-3-(5-methyl-2H-benzo[d][1 ,2,3]triazol-2-yl)benzyl methacrylate (WL-6), 2-hydroxy-5-methyl-3-(5-(trifluoromethyl)-2H-benzo[d][1 ,2,3]triazol-2-yl)benzyl methacrylate (WL-7), 4-allyl-2-(5-chloro-2H-benzo[d][1 ,2,3]triazol-2-yl)-6-methoxyphenol (WL-8), 2-{2'-Hydroxy-3'-fe/f-5'[3"-(4"-vinylbenzyloxy)propoxy]phenyl}-5-methoxy-2/-/-benzotriazole, phenol, 2-(5-chloro-2H-benzotriazol-2-yl)-6-(1 ,1-dimethylethyl)-4-ethenyl- (UVAM), 2-[2'-hydroxy-5'-(2-methacryloxyethyl)phenyl)]-2H-benzotriazole (2-Propenoic acid, 2-methyl-, 2-[3-(2H-benzotriazol-2-yl)-4-hydroxyphenyl]ethyl ester, Norbloc), 2-{2'-Hydroxy-3'-fe/?-butyl-5'-[3'-

methacryloyloxypropoxy]phenyl}-2/-/-benzotriazole, 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-methoxy-2/-/-benzotriazole (UV1 3), 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-chloro-2/-/-benzotriazole (UV28), 2-[2'-Hydroxy-3'-fe/f-butyl-5'-(3'-aciyloyloxypropoxy)phenyl]-5-trifluoromethyl-2/-/-benzotriazole (UV23), 2-(2'-hydroxy-5-methacrylamidophenyl)-5-methoxybenzotriazole (UV6), 2-(3-allyl-2-hydroxy-5-methylphenyl)-2/-/-benzotriazole (UV9), 2-(2-Hydroxy-3-methallyl-5-methylphenyl)-2/-/-benzotriazole (UV1 2), 2-3'-t-butyl-2'-hydroxy-5'-(3''-dimethylvinylsilylpropoxy)-2'-hydroxy-phenyl)-5-methoxybenzotriazole (UV1 5), 2-(2'-hydroxy-5'-methacryloylpropyl-3'-tert-butyl-phenyl)-5-methoxy-2/-/-benzotriazole (UV1 6), 2-(2'-hydroxy-5'-acryloylpropyl-3'-tert-butyl-phenyl)-5-methoxy-2/-/-benzotriazole (UV1 6A), 2-Methylacrylic acid 3-[3-tert-butyl-5-(5-chlorobenzotriazol-2-yl)-4-hydroxyphenyl]-propyl ester (16-1 00, CAS#96478-1 5-8), 2-(3-(tert-butyl)-4-hydroxy-5-(5-methoxy-2H-benzo[d][1 ,2,3]triazol-2-yl)phenoxy)ethyl methacrylate (16-1 02); Phenol, 2-(5-chloro-2H-benzotriazol-2-yl)-6-methoxy-4-(2-propen-1 -yl) (CAS#1 260 14 1-20-5) ; 2-[2-Hydroxy-5-[3-(methacryloyloxy)propyl]-3-te/f-butylphenyl]-5-chloro-2/-/-benzotriazole; Phenol, 2-(5-ethenyl-2H-benzotriazol-2-yl)-4-methyl-, homopolymer (9CI) (CAS#83063-87-0). In accordance with the invention , the polymerizable composition comprises about 0.1 % to about 3.0% , preferably about 0.2% to about 2.5%, more preferably about 0.3% to about 2.0%, by weight of one or more UV-absorbing vinylic monomers, related to the amount of all polymerizable components in the polymerizable composition .

In a preferred embodiment, a silicone hydrogel contact lens of the invention comprises repeating units of a UV-absorbing vinylic monomer and repeating units of a UV/HEVL absorbing vinylic monomer. More preferably, the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 10% or less (preferably about 5% or less, more preferably about 2.5% or less, even more preferably about 1% or less) between 280 and 315 nanometers and a UVA transmittance of about 30% or less (preferably about 20% or less, more preferably about 10% or less, even more preferably about 5% or less) between 315 and 380 nanometers and and a Violet transmittance of about 70% or less, preferably about 60% or less, more preferably about 50% or less, even more preferably about 40% or less) between 380 nm and 440 nm. Even more preferably, the UV-absorbing vinylic monomer is 2-[2'-hydroxy-5'-(2-methacryloxyethyl)phenyl)]-2H-benzotriazole (Norbloc), and the UV/HEVL absorbing vinylic monomer is 2-{2'-Hydroxy-3'-fe/?-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-2/-/-benzotriazole, 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-methoxy-2/-/-benzotriazole (UV1 3), 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-chloro-2/-/-benzotriazole (UV28), 2-[2'-Hydroxy-3'-fe/if-butyl-5'-(3'-acryloyloxypropoxy)phenyl]-5-trifluoromethyl-2/-/-benzotriazole (UV23), or combinations thereof.

In accordance with the invention, a silicone hydrogel contact lens of the invention can further comprise repeating units of one or more hydrophilic acrylic monomers, preferably in an amount of about 10% or less (preferably about 8% or less, more preferably about 5% or less) by weight relative to the dried weight of the silicone hydrogel contact lens. The amount of the repeating units of a hydrophilic acrylic monomer can be calculated based on the amount of the hydrophilic acrylic monomer in a polymerizable composition used for preparing the silicone hydrogel contact lens over the total amount of all polymerizable components in the polymerizable composition.

Examples of preferred hydrophilic acrylic monomers include without limitation N,N-dimethyl (meth)acrylamide, (meth)acrylamide, N-hydroxylethyl (meth)acrylamide, N-hydroxypropyl (meth)acrylamide, hydroxyethyl (meth)acrylate, glycerol methacrylate (GMA), polyethylene glycol (meth)acrylate having a number average molecular weight of up to 1500, polyethylene glycol $C_1$-$C_4$-alkyl ether (meth)acrylate having a number average molecular weight of up to 1500, /V-[tris(hydroxymethyl)methyl]-acrylamide, (meth)acrylic acid, ethylacrylic acid, and combinations thereof. Preferably, the hydrophilic acrylic monomer is N,N-dimethyl (meth)acrylamide, hydroxyethyl (meth)acrylate, N-hydroxylethyl (meth)acrylamide, glycerol methacrylate (GMA), or combinations thereof.

A silicone hydrogel contact lens of the invention can also comprise other necessary components known to a person skilled in the art, such as, for example, one or more free radical initiator, a visibility tinting agent (e.g., repeating units of one or more polymerizable dyes, pigments, or mixtures thereof), antimicrobial agents (e.g., preferably silver nanoparticles), a bioactive agent, leachable lubricants, leachable tear-stabilizing agents, and mixtures thereof, as known to a person skilled in the art.

Suitable thermal polymerization initiators are known to the skilled artisan and comprise, for example peroxides, hydroperoxides, azo-bis(alkyl- or cycloalkylnitriles), persulfates, percarbonates or mixtures thereof. Examples are benzoylperoxide, tert.-butyl peroxide, di-tert.-butyl-diperoxyphthalate, tert.-butyl hydroperoxide, azo-bis(isobutyronitrile) (AIBN), 1,1-azodiisobutyramidine, 1,1'-azo-bis (1-cyclohexanecarbonitrile), 2,2'-azo-bis(2,4-dimethylvaleronitrile) and the like.

Suitable photoinitiators are benzoin methyl ether, diethoxyacetophenone, a benzoylphosphine oxide, 1-hydroxycyclohexyl phenyl ketone and Darocur and Irgacur types, preferably Darocur 1173® and Darocur 2959®, Germane-based Norrish Type I photoinitiators. Examples of benzoylphosphine initiators include 2,4,6-trimethylbenzoyldiphenylophosphine oxide; bis-(2,6-dichlorobenzoyl)-4-N-propylphenylphosphine oxide; and bis-(2,6-dichlorobenzoyl)-4-N-butylphenylphosphine oxide. Reactive photoinitiators which can be incorporated, for example, into a macromer or can be used as a special monomer are also suitable. Examples of reactive photoinitiators are those disclosed in EP 632 329.

Where a vinylic monomer capable of absorbing ultra-violet radiation and high energy violet light (HEVL) is used in the invention, a Germane-based Norrish Type I photoinitiator and a light source including a light in the region of about 400 to about 550 nm are preferably used to initiate a free-radical polymerization . Any Germane-based Norrish Type I photoinitiators can be used in this invention, so long as they are capable of initiating a free-radical polymerization under irradiation with a light source including a light in the region of about 400 to about 550 nm. Examples of Germane-based Norrish Type I photoinitiators are acylgermanium compounds described in U.S. Pat. No. 76051 90.

The bioactive agent is any compound that can prevent a malady in the eye or reduce the symptoms of an eye malady. The bioactive agent can be a drug, an amino acid (e.g., taurine, glycine, etc.), a polypeptide, a protein, a nucleic acid, or any combination thereof. Examples of drugs useful herein include, but are not limited to, rebamipide, ketotifen, olaptidine, cromoglycolate, cyclosporine, nedocromil, levocabastine, lodoxamide, ketotifen, or the pharmaceutically acceptable salt or ester thereof. Other examples of bioactive agents include 2-pyrrolidone-5-carboxylic acid (PCA), alpha hydroxyl acids (e.g., glycolic, lactic, malic, tartaric, mandelic and citric acids and salts thereof, etc.), linoleic and gamma linoleic acids, and vitamins (e.g., B5, A, B6, etc.).

Examples of leachable lubricants include without limitation mucin-like materials (e.g., polyglycolic acid) and non-crossllinkable hydrophilic polymers (i.e., without ethylenically unsaturated groups). Any hydrophilic polymers or copolymers without any ethylenically unsaturated groups can be used as leachable lubricants. Preferred examples of non-crosslinkable hydrophilic polymers include, but are not limited to, polyvinyl alcohols (PVAs), polyamides, polyimides, polylactone, a homopolymer of a vinyl lactam, a copolymer of at least one vinyl lactam in the presence or in the absence of one or more hydrophilic vinylic comonomers, a homopolymer of acrylamide or methacrylamide, a copolymer of acrylamide or methacrylamide with one or more hydrophilic vinylic monomers, polyethylene oxide (i.e., polyethylene glycol (PEG)), a polyoxyethylene derivative, poly-N-N-dimethylacrylamide, polyacrylic acid, poly 2 ethyl oxazoline, heparin polysaccharides, polysaccharides, and mixtures thereof. The number average molecular weight $M_w$ of the non-crosslinkable hydrophilic polymer is preferably from 5,000 to 1,000,000.

Examples of leachable tear-stabilizing agents include, without limitation, phospholipids, monoglycerides, diglycerides, triglycerides, glycolipids, glyceroglycolipids, sphingolipids, sphingo-glycolipids, fatty alcohols, fatty acids, mineral oils, and mixtures thereof. Preferably, a tear stabilizing agent is a phospholipid, a monoglyceride, a diglyceride, a triglyceride, a glycolipid, a glyceroglycolipid, a sphingolipid, a sphingo-glycolipid, a fatty acid having 8 to 36 carbon atoms, a fatty alcohol having 8 to 36 carbon atoms, or a mixture thereof.

In a preferred embodiment, a silicone hydrogel contact lens of the invention comprises about 60% or more by weight (preferably about 65% or more by weight, more preferably about 70% or more by weight, even more preferably about 75% or more by weight) of the first, second, and third repeating units relative to the dry weight of the silicone hydrogel contact lens. The total amount of the first, second, and third repeating units can be calculated based on the sum of the amounts of the siloxane-containing vinylic monomer, the linear polysiloxane vinylic crosslinker and the hydrophilic N-vinyl amide monomer in a polymerizable composition used for preparing the silicone hydrogel contact lens over the total amount of all polymerizable components in the polymerizable composition.

A silicone hydrogel contact lens of the invention can be prepared from a polymerizable composition (i.e., a lens-forming composition or a lens formulation) according to a method of the invention which is another aspect of the invention.

A polymerizable composition can be prepared by dissolving all of the desirable components in any suitable solvent, such as, a mixture of water and one or more organic solvents miscible with water, an organic solvent, or a mixture of one or more organic solvents, as known to a person skilled in the art. The term "solvent" refers to a chemical that cannot participate in free-radical polymerization reaction.

Example of preferred organic solvents includes without limitation, tetrahydrofuran, tripropylene glycol methyl ether, dipropylene glycol methyl ether, ethylene glycol n-butyl ether, ketones (e.g., acetone, methyl ethyl ketone, etc.), diethylene glycol n-butyl ether, diethylene glycol methyl ether, ethylene glycol phenyl ether, propylene glycol methyl ether, propylene glycol methyl ether acetate, dipropylene glycol methyl ether acetate, propylene glycol n-propyl ether, dipropylene glycol n-propyl ether, tripropylene glycol n-butyl ether, propylene glycol n-butyl ether, dipropylene glycol n-butyl ether, tripropylene glycol n-butyl ether, propylene glycol phenyl ether dipropylene glycol dimetyl ether, polyethylene glycols, polypropylene glycols, ethyl acetate, butyl acetate, amyl acetate, methyl lactate, ethyl lactate, i-propyl lactate, methylene chloride, 2-butanol, 1-propanol, 2-propanol, menthol, cyclohexanol, cyclopentanol and exonorborneol, 2-pentanol, 3-pentanol, 2-hexanol, 3-hexanol, 3-methyl-2-butanol, 2-heptanol, 2-octanol, 2-nonanol, 2-decanol, 3-octanol, norborneol, tert-butanol, tert-amyl alcohol, 2-methyl-2-pentanol, 2,3-dimethyl-2-butanol, 3-methyl-3-pentanol, 1-methylcyclohexanol, 2-methyl-2-hexanol, 3,7-dimethyl-3-octanol, 1-chloro-2-methyl-2-propanol, 2-methyl-2-heptanol, 2-methyl-2-octanol, 2-2-methyl-2-nonanol, 2-methyl-2-decanol, 3-methyl-3-hexanol, 3-methyl-3-heptanol, 4-methyl-4-heptanol, 3-methyl-3-octanol, 4-methyl-4-octanol, 3-methyl-3-nonanol, 4-methyl-4-nonanol, 3-methyl-3-octanol, 3-ethyl-3-hexanol, 3-methyl-3-heptanol, 4-ethyl-4-heptanol, 4-propyl-4-heptanol, 4-isopropyl-4-heptanol, 2,4-dimethyl-2-pentanol, 1-methylcyclopentanol, 1-ethylcyclopentanol, 1-ethylcyclopentanol, 3-hydroxy-3-methyl-1 -butene, 4-hydroxy-4-methyl-1 -cyclopentanol, 2-

phenyl-2-propanol, 2-methoxy-2-methyl-2-propanol 2,3,4-trimethyl-3-pentanol, 3,7-dimethyl-3-octanol, 2-phenyl-2-butanol, 2-methyl-1 -phenyl-2-propanol and 3-ethyl-3-pentanol, 1-ethoxy-2-propanol, 1-methyl-2-propanol, t-amyl alcohol, isopropanol, 1-methyl-2-pyrrolidone, N,N-dimethylpropionamide, dimethyl formamide, dimethyl acetamide, dimethyl propionamide, N-methyl pyrrolidinone, and mixtures thereof.

In another aspect, the present invention provides a method for producing inherently-wettable silicone hydrogel contact lenses. The method comprises the steps of: preparing a polymerizable composition which is clear at room temperature and optionally but preferably at a temperature of from about 0 to about 4°C, wherein the polymerizable composition comprises (a) at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties, (b) at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having at least two second H-donor moieties, (c) at least one hydrophilic N-vinyl amide monomer, (d) optionally at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties, and (e) at least one free radical initiator, wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker, wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of -NHR°, amino linkages of -NH- , amide linkages of -CONH- , urethane linkages of -OCONH- , or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl, wherein the polymerizable composition comprises at least 8.8 mmoles of component (c) per gram of all components (a), (b) and (d) in total and at least 0.11 meqs of all the first, second and third H-donor moieties in total per gram of component (c); introducing the polymerizable composition into a lens mold; curing thermally or actinically the polymerizable composition in the lens mold to form a silicone hydrogel contact lens, wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers, an elastic modulus of from about 0.2 MPa to about 1.5 MPa, and an equilibrium water content of from about 40% to about 70% and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds and a water contact angle by captive bubble of about 80 degrees or less without being subjected to any post-curing surface treatment.

Various embodiments described above of siloxane-containing vinylic monomers, linear chain-extened polysiloxane vinylic crosslinkers, hydrophilic N-vinyl amide monomers, non-silicone vinylic crosslinking agents, blending vinylic monomers, UV-absorbing vinylic monomers, hydrophilic vinylic monomers, free radical initiators, visibility-tinting agents, and solvents should be incorporated into this aspect of the invention.

In a preferred embodiment, a polymerizable composition of the invention comprises about 60% or more by weight (preferably about 65% or more by weight, more preferably about 70% or more by weight, even more preferably about 75% or more by weight) of all components (a), (b) and (c) in total relative to the total weight of all polymerizable components in the polymerizable composition.

The thermal polymerization is carried out conveniently in an above-mentioned solvent at elevated temperature, for example at a temperature of from 25 to 100°C and preferably 40 to 80°C. The reaction time may vary within wide limits, but is conveniently, for example, from 1 to 24 hours or preferably from 2 to 12 hours. It is advantageous to previously degas the components and solvents used in the polymerization reaction and to carry out said copolymerization reaction under an inert atmosphere, for example under a nitrogen or argon atmosphere.

The actinic polymerization can then be triggered off by actinic radiation, for example light, in particular UV light or visible light of a suitable wavelength . The spectral requirements can be controlled accordingly, if appropriate, by addition of suitable photosensitizers.

Lens molds for making contact lenses are well known to a person skilled in the art and, for example, are employed in cast molding or spin casting. For example, a mold (for cast molding) generally comprises at least two mold sections (or portions) or mold halves, i.e. first and second mold halves. The first mold half defines a first molding (or optical) surface and the second mold half defines a second molding (or optical) surface. The first and second mold halves are configured to receive each other such that a lens forming cavity is formed between the first molding surface and the second molding surface. The molding surface of a mold half is the cavity-forming surface of the mold and in direct contact with lens-forming material.

Methods of manufacturing mold sections for cast-molding a contact lens are generally well known to those of ordinary skill in the art. The process of the present invention is not limited to any particular method of forming a mold. In fact, any method of forming a mold can be used in the present invention . The first and second mold halves can be formed through various techniques, such as injection molding or lathing . Examples of suitable processes for forming the mold halves are disclosed in U.S. Pat. Nos. 444471 1; 4460534; 5843346; and 5894002.

Virtually all materials known in the art for making molds can be used to make molds for making contact lenses. For example, polymeric materials, such as polyethylene, polypropylene, polystyrene, PMMA, Topas® COC grade 8007-S1 0 (clear amorphous copolymer of ethylene and norbornene, from Ticona GmbH of Frankfurt, Germany and Summit, New Jersey), or the like can be used. Other materials that allow UV light transmission could be used , such as quartz glass and sapphire.

In accordance with the invention, the polymerizable composition can be introduced (dispensed) into a cavity formed by a mold according to any known methods.

After the polymerizable composition is dispensed into the mold, it is polymerized to produce a contact lens. Crosslinking may be initiated thermally or actinically to crosslink the polymerizable components in the polymerizable composition.

Opening of the mold so that the molded article can be removed from the mold may take place in a manner known *per se.*

The molded contact lens can be subject to lens extraction to remove unpolymerized polymerizable components. The extraction solvent can be any solvent known to a person skilled in the art. Examples of suitable extraction solvent are those solvent described above. After extraction, lenses can be hydrated in water or an aqueous solution of a wetting agent (e.g., a hydrophilic polymer).

The molded contact lenses can further subject to further processes, such as, for example, hydration, packaging in lens packages with a packaging solution which is well known to person skilled in the art; sterilization such as autoclave at from 118 to 124°C for at least about 30 minutes; and the like.

Lens packages (or containers) are well known to a person skilled in the art for autoclaving and storing a soft contact lens. Any lens packages can be used in the invention. Preferably, a lens package is a blister package which comprises a base and a cover, wherein the cover is detachably sealed to the base, wherein the base includes a cavity for receiving a sterile packaging solution and the contact lens.

Lenses are packaged in individual packages, sealed, and sterilized (e.g., by autoclave at about 120°C or higher for at least 30 minutes under pressure) prior to dispensing to users. A person skilled in the art will understand well how to seal and sterilize lens packages.

In accordance with the invention, a packaging solution contains at least one buffering agent and one or more other ingredients known to a person skilled in the art. Examples of other ingredients include without limitation, tonicity agents, surfactants, antibacterial agents, preservatives, and lubricants (e.g., cellulose derivatives, polyvinyl alcohol, polyvinyl pyrrolidone).

Although various embodiments of the invention have been described using specific terms, devices, and methods, such description is for illustrative purposes only. The words used are words of description rather than of limitation. As would be obvious to one skilled in the art, many variations and modifications of the invention may be made by those skilled in the art without departing from the spirit or scope of the novel concepts of the disclosure. In addition, it should be understood that aspects of the various embodiments may be interchanged either in whole or in part or can be combined in any manner and/or used together, as illustrated below:

1. A silicone hydrogel contact lens, comprising a silicone hydrogel bulk material which comprises: (1) first repeating units of at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties; (2) second repeating units of at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having one or more second H-donor moieties; (3) third repeating units of at least one hydrophilic N-vinyl amide monomer; and (4) optionally fourth repeating units of at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties, wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker, wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of -NHR°, amino linkages of -NH- , amide linkages of -CONH-, urethane linkages of -OCONH- , or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl, wherein the silicone hydrogel bulk material comprises at least 8.8 mmole of the third repeating units per gram of all the first, second and fourth repeating units in total (i.e., $\frac{\text{[3rd repeating units] mmoie}}{\text{([1st repeating units] + [2nd repeating units] + [4th repeating units]) g}} = 8.8 \text{ mmole/g}$) and at least 0.11 meqs of all the first, second and third H-donor moieties in total per gram of the third repeating units (i.e., $\frac{\text{([1st H-D]+[2nd H-D]+[3rd H-D]) meq}}{\text{[3rd repeating units] g}} = 0.11 \text{ meq/g}$), wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers, an elastic modulus of from about 0.2 MPa to about 1.5 MPa, and an equilibrium water content of from about 40% to about 70% and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds and a water contact angle by captive bubble of about 80 degrees or less without being subjected to any post-curing surface treatment.

2. The silicone hydrogel contact lens of embodiment 1, wherein the silicone hydrogel bulk material comprises at least 9.0 mmole of the third repeating units per gram of all the first, second and fourth repeating units in total.

3. The silicone hydrogel contact lens of embodiment 1, wherein the silicone hydrogel bulk material comprises at least 9.2 mmole of the third repeating units per gram of all the first, second and fourth repeating units in total.

4. The silicone hydrogel contact lens of embodiment 1, wherein the silicone hydrogel bulk material comprises at least 9.6 mmole of the third repeating units per gram of all the first, second and fourth repeating units in total.

5. The silicone hydrogel contact lens of any one of embodiments 1 to 4, wherein the silicone hydrogel bulk material comprises at least 0.15 meqs of all the first, second and third

H-donor moieties in total per gram of the third repeating units.

6. The silicone hydrogel contact lens of any one of embodiments 1 to 4, wherein the silicone hydrogel bulk material comprises at least 0.20 meqs of all the first, second and third H-donor moieties in total per gram of the third repeating units.

7. The silicone hydrogel contact lens of any one of embodiments 1 to 4, wherein the silicone hydrogel bulk material comprises at least 0.25 meqs of all the first, second and third H-donor moieties in total per gram of the third repeating units.

8. The silicone hydrogel contact lens of any one of embodiments 1 to 7, wherein the silicone hydrogel contact lens has a water-break-up-time of at least 15 seconds without being subjected to any post-curing surface treatment.

9. The silicone hydrogel contact lens of any one of embodiments 1 to 7, wherein the silicone hydrogel contact lens has a water-break-up-time of at least 20 seconds without being subjected to any post-curing surface treatment.

10. The silicone hydrogel contact lens of any one of embodiments 1 to 9, wherein the silicone hydrogel contact lens has a water contact angle by captive bubble of about 75 degrees or less without being subjected to any post-curing surface treatment.

11. The silicone hydrogel contact lens of any one of embodiments 1 to 9, wherein the silicone hydrogel contact lens has a water contact angle by captive bubble of about 70 degrees or less without being subjected to any post-curing surface treatment.

12. The silicone hydrogel contact lens of any one of embodiments 1 to 9, wherein the silicone hydrogel contact lens has a water contact angle by captive bubble of about 65 degrees or less without being subjected to any post-curing surface treatment.

13. The silicone hydrogel contact lens of any one of embodiments 1 to 12, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 60 barrers.

14. The silicone hydrogel contact lens of any one of embodiments 1 to 12, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 70 barrers.

15. The silicone hydrogel contact lens of any one of embodiments 1 to 12, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 80 barrers.

16. The silicone hydrogel contact lens of any one of embodiments 1 to 12, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 100 barrers.

17. The silicone hydrogel contact lens of any one of embodiments 1 to 16, wherein the silicone hydrogel contact lens has an equilibrium water content of from about 43% to about 65% by weight.

18. The silicone hydrogel contact lens of any one of embodiments 1 to 16, wherein the silicone hydrogel contact lens has an equilibrium water content of from about 45% to about 60% by weight.

19. The silicone hydrogel contact lens of any one of embodiments 1 to 18, wherein the

silicone hydrogel contact lens has an elastic modulus of from about 0.3 MPa to about 1.2 MPa or less.

20. The silicone hydrogel contact lens of any one of embodiments 1 to 18, wherein the silicone hydrogel contact lens has an elastic modulus of from about 0.4 MPa to about 1.0 MPa or less.

21. The silicone hydrogel contact lens of any one of embodiments 1 to 20, wherein the linear chain-extended polysiloxane vinylic crosslinker has a number average molecular weight of from about 4000 to about 40000 Daltons.

22. The silicone hydrogel contact lens of any one of embodiments 1 to 20, wherein the linear chain-extended polysiloxane vinylic crosslinker has a number average molecular weight of from about 5000 to about 20000 Daltons.

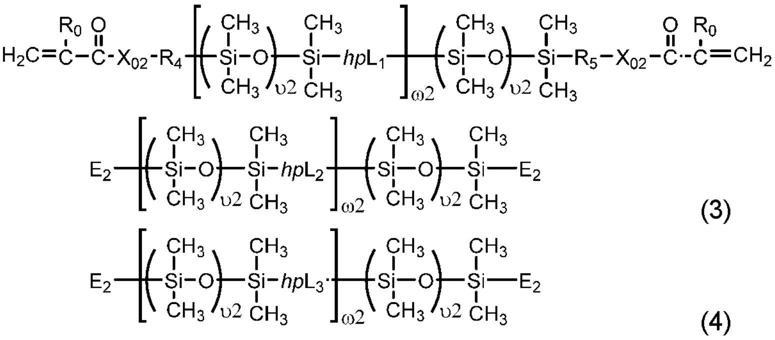
23. The silicone hydrogel contact lens of any one of embodiments 1 to 22, wherein the linear chain-extended polysiloxane vinylic crosslinker comprises two terminal (meth)acryloyl groups and from 2 to 20 polysiloxane segments each pair of which are linked via an organic radical having at least two H-donor moieties selected from group consisting of urethane linkage of -OCONH-, hydroxyl groups, carboxyl groups, amino groups of $-NHR^0$, amino linkages of -NH- , amide linkages of -CONH- , and combinations thereof, wherein the polysiloxane vinylic crosslinker.

24. The silicone hydrogel contact lens of any one of embodiments 1 to 23, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (1)

$$E_1\left[\begin{matrix}CH_3\\|\\Si\\|\\CH_3\end{matrix}-O\left(\begin{matrix}CH_3\\|\\Si\\|\\CH_3\end{matrix}-O\right)_{\upsilon 1}L_3\right]_{\omega 1}\left(\begin{matrix}CH_3\\|\\Si\\|\\CH_3\end{matrix}-O\right)_{\upsilon 1}\begin{matrix}CH_3\\|\\Si\\|\\CH_3\end{matrix}-E_1 \qquad (1)$$

in which: $\upsilon 1$ is an integer of from 5 to 50 and $\omega 1$ is an integer of from 1 to 15; $L_3$ is a divalent radical of $-L_3'-O-(C_2H_4O)_{q1}-CONH-R_2-(NHCO-PE-CONH-R_2)_{g1}-NHCO-(OC_2H_4)_{q2}-O-L_3'-$ ; PE is a divalent radical of $-(CH_2CH_2O)_{q3}-Z_0-CF_2-(OCF_2)_x-(OCF_2CF_2)_y-OCF_2-Z_0-(OCH_2CH_2)_{q3}-$ or $-Z_0-(CH_2CH_2O)_{q4}-(CH_2-CH(CH_3)-O)_{q5}-(CH_2-CH(C_2H_5)-O)_{q6}-Z_0-$ ; $E_1$ is a monovalent radical of $H_2C=C(R_0)-C(=O)-X_{01}-L_4-$ ; $L_4$ is a divalent radical of $-C_2H_4-NHCO-O-(C_2H_4O)_{q2}-L_3'-$, $-(C_2H_4O)_{q1}-CONH-R_2-NHCO-O-(C_2H_4O)_{q2}-L_3'-$, $-R_3-O-CONH-R_2-NHCO-O-(C_2H_4O)_{q2}-L_3'-$, $-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{q2}-L_3'-$, or $-(C_2H_4O)_{q2}-L_3'-$ ; $R_0$ is H or methyl; $X_{01}$ is O or $NR_{n1}$; $R_{n1}$ is H or a C1-C10 alkyl; $R_2$ is a C4-C14 hydrocarbon divalent radical; $R_3$ is a $C_2$-$C_6$ alkylene divalent radical; $L_3'$ is $C_3$-$C_8$ alkylene divalent radical; $Z_0$ is a direct bond or a C1-C12 alkylene divalent radical; g1 is 1 or zero; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; q3 is an integer of 0 to 2; q4 is an integer of 2 to 50, q5 and q6 independent of each other are a number of 0 to 35; provided that (q4+q5+q6) is an integer of 2 to 50; x+y is an integer of from 10 to 30.

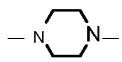
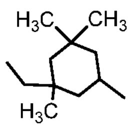
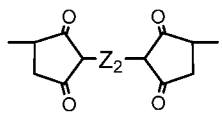
25. The silicone hydrogel contact lens of any one of embodiments 1 to 23, wherein the linear chain-extended polysiloxane vinylic crosslinker is represented by formula (2), (3) or (4)

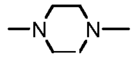


(2)

(3)

(4)

in which: $hpL_1$ is a divalent radical of $-R_4-CH(R_0)-CH_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-Y_1-NR_{n2}-C(=O)-CH(NH-C(=O)-CH_3)-C_2H_4-S-CH_2-CH(R_0)-R_5-$; $hpL_2$ is a divalent radical of $-R_4-NR_{n2}-C(=O)-CH(NH-C(=O)-CH_3)-C_2H_4-S-Y_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-R_5-$; $hpL_3$ is a divalent radical of $-R_4-NR_{n2}-C(=O)-CH(NH-C(=O)-CH_3)-C_2H_4-S-Y_3-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-R_5-$; $Y_1$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, a divalent radical of  , or a divalent radical of  ; $Y_2$ is a divalent radical of $-CH_2-CH(R_0)-C(=O)-Z_3-C(=O)-CH(R_0)-CH_2-$ ; $Y_3$ is a divalent radical of $-CH_2-CH_2-S(=O)_2-(Z_1-S(=O)_2)_{m1}-CH_2-CH_2-$ or  ; $Z_1$ is a $C_1$-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical; $Z_2$ is a $C_1$-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, a dihydroxyl- or dimethoxy-substituted $C_2$-$C_6$ alkylene divalent radical, a divalent radical of $-C_2H_4-(O-C_2H_4)_{m2}-$, a divalent radical of $-Z_4-S-S-Z_4-$, a hydroxyl- or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical;

$Z_3$ is a divalent radical of any one of (a) $-NR_{n3}-$, (b) , (c) $-NR_{0}-Z_5-NR_{0}-$, and (d) $-O-Z_6-O-$; $Z_4$ is a $C_1$-$C_6$ alkylene divalent radical; $Z_5$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical; $Z_6$ is (a) a $C_1$-$C_6$ alkylene divalent radical, (b) a divalent radical of $-\left(CH_2-\overset{H}{C}H-CH_2-O\right)-\overset{H}{C}H-CH_2-$ (¾ 3 ... -C?H -CH 2 -),

$$-CH_2-\overset{OH}{CH}-CH_2-O-CH_2-CH_2-O-CH_2-\overset{OH}{CH}-CH_2-,\quad -\left(CH_2-CH_2-O\right)_{m4}-CH_2-CH_2-,$$

$$-\left(CH_2\right)_{m5}-O-\overset{O}{\underset{OH}{P}}-O-\left(CH_2\right)_{m5}-$$

, or (c) a substituted $C_3$-$C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group; $Z_7$ is a divalent radical of

$$-Z_3-\overset{O}{C}-\overset{R_0}{C}H-CH_2-S-C_2H_4-\underset{}{\overset{H_3C-\overset{O}{C}-NH}{CH}}-\overset{O}{C}-NR_{n2}-R_4-;$$

$Z_8$ is a divalent radical of

$$-Z_9-\overset{O}{C}-\overset{R_0}{C}H-CH_2-S-C_2H_4-\overset{H_3C-\overset{O}{C}-NH}{CH}-\overset{O}{C}-NR_{n2}-R_4-;$$

$E_2$ is a monovalent radical of

$$H_2C=\overset{R_0}{C}-\overset{O}{C}-Z_7-;$$

$\upsilon 2$ is an integer of from 5 to 50; $\omega 2$ is an integer of from 1 to 15; $X_{02}$ is O or $NR_{n2}$; $R_0$ is hydrogen or methyl; $R_{n2}$ is hydrogen or $C_1$-$C_4$-alkyl; $R_{n3}$ is hydrogen or $C_1$-$C_3$ alkyl; $R_4$ and $R_5$ independent of each other are a $C_1$-$C_6$ alkylene divalent radical or a $C_1$-$C_6$ alkylene-oxy-$C_1$-$C_6$ alkylene divalent radical; m1 is 0 or 1, m2 is an integer of 1 to 6, m3 is 1 or 2, m4 is an integer of 1 to 5, m5 is 2 or 3.

26. The silicone hydrogel contact lens of any one of embodiments 1 to 23, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (5)

$$E_3-\left[R_6-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 3}-\underset{CH_3}{\overset{CH_3}{Si}}-R_2-hpL_4-pOAlk-hpL_4\right]_{\omega 3}-R_6-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 3}-\underset{CH_3}{\overset{CH_3}{Si}}-R_7-E_3 \quad (5)$$

in which: $\upsilon 3$ is an integer of from 5 to 50; $\omega 3$ is an integer of from 1 to 15; $E_3$ is a monovalent radical of $H_2C=\overset{R_0}{C}-\overset{O}{C}-X_{03}-$ in which $R_0$ is hydrogen or methyl, $X_{03}$ is O or $NR_{n4}$, and $R_{n4}$ is hydrogen or $C_1$-$C_4$-alkyl; $R_6$ and $R_7$ independent of each other are a $C_1$-$C_6$ alkylene divalent radical or a $C_1$-$C_6$ alkoxy-$C_1$-$C_6$ alkylene divalent radical; pOAlk is a divalent radical of $-(EO)_{e1}(PO)_{p1}(BO)_{b1}-$ in which EO is an oxyethylene unit ($-CH_2CH_2O-$), PO is an oxypropylene unit ($-CH_2-\underset{CH_3}{CH}-O-$), and BO is an oxybutylene unit ($-CH_2-\underset{C_2H_5}{CH}-O-$), e1 is an integer of 5 to 100, p1 and b1 independent of each other are an integer of 0 to 50, provided that (e1 +p1 +b1 )>1 0 and $e1/(p1+b1) \geq 2$ (preferably from about 2:1 to about 10:1, more preferably from about 3:1 to about 6:1 ) when (p1 +b1 )>1 ; *h*p l_4 is a divalent radical of

$$-X_{03}-\overset{O}{\overset{\|}{C}}-\overset{R_0}{\overset{|}{C}H}-CH2-S-C_2H_4-\overset{H_3C-\overset{O}{\overset{\|}{C}}-NH}{\overset{|}{C}H}-\overset{O}{\overset{\|}{C}}NR_{n4}-R_8- \text{ or } -R_9-NR_{n4}-\overset{O}{\overset{\|}{C}}-\overset{HN-\overset{O}{\overset{\|}{C}}-CH_3}{\overset{|}{C}H}-C_2H_4-S-CH2-\overset{R_0}{\overset{|}{C}H}-\overset{O}{\overset{\|}{C}}-X_{03}-$$

in which $R_8$ and $R_9$ independent of each other are a substituted or unsubstituted $C_1$-$C_{12}$ alkylene divalent radical.

27. The silicone hydrogel contact lens of any one of embodiments 1 to 23, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (6)

$$E_4-\left[\left(\begin{matrix}CH_3\\ |\\ Si-O\\ |\\ CH_3\end{matrix}\right)_{\upsilon4}\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}-G_1-CH_2-\overset{R_0}{\overset{|}{C}H}-S-J_0-S-\overset{R_0}{\overset{|}{C}H}-CH_2-G_1\right]_{\omega4}\left(\begin{matrix}CH_3\\ |\\ Si-O\\ |\\ CH_3\end{matrix}\right)_{\upsilon4}\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}-E_4 \quad (6)$$

in which: v4 is an integer from 5 to 100; ω4 is an integer of 1 to 15; $R_0$ is hydrogen or methyl; Jo is a C1-C12 hydrocarbon radical having 0 to 2 hydroxyl or carboxyl groups; G1 is a direct bond, a $C_{1\text{-}C4}$ alkylene divalent radical, or a bivalent radical of

$$-X_{04}-(C_2H_4O)_{h1}-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-,$$

$$-X_{05}-M_2-O-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-, \quad -X_{06}-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-,$$

$$-X_{07}-(C_2H_4O)_{h2}-M_0-; \quad -X_{08}-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-,$$

$$-X_{10}-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h2}-M_0-, \quad -X_{07}-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-, \text{ or}$$

$$-X_{08}-(C_2H_4O)_{h1}-CH_2-CH(OH)-CH_2-O-M_0-$$ in which h1 is an integer of 1 to 20; h2 is an integer of 0 to 20; $M_0$ is $C_3$-$C_8$ alkylene divalent radical; $M_1$ is a C4-C14 hydrocarbon divalent radical; $M_2$ and $M_3$ independent of each other are a Ci-C $_6$ alkylene divalent radical; $X_{o4}$ is -COO- or -CONRn5-; $R_{n}$s is H or a C1-C10 alkyl; $X_{05}$ and $X_{07}$ independent of each other are a direct bond, -COO- or -CONRns-; $X_{o6}$ is a direct bond, a Ci-C $_6$ alkylene divalent radical, a Ci-C $_6$ alkylenoxy divalent radical, -COO-, or -CONRns-; $X_{o8}$ is a direct bond or -COO-; $X_0$g is O or NRn5; X10 is a direct bond, a Ci-C $_6$ alkylene divalent radical, -COO-, or -CONRns-; Provided that $M_0$ is linked to Si atom while $X_{04}$ to $X_{10}$ are linked to the group of -CH $_2$- in formula (6) and that at least one of $J_1$ and G1 comprises at least one moieties selected from the group consisting of hydroxyl groups, urethane linkage of -OCONH- , amino groups of -$NHR^0$, amino linkages of -NH- , amide linkages of -CONH-, carboxyl groups, and combinations thereof; $E_4$ is a monovalent radical of $H_2C=\overset{R_0}{\overset{|}{C}}-\overset{O}{\overset{\|}{C}}-X_{i1}-G_2-$ or

$H_2C-\overset{R_0}{C}-\overset{O}{\overset{\|}{C}}-G_3-$; $\chi_{11}$ $j_S$ **O** or NRn5; $G_2$ is a **$C_1$-$C_4$** alkylene divalent radical or a bivalent radical of $-(C_2H_4O)_{h1}-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$,

$-M_2-O-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$, $-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-$,

$-(C_2H_4O)_{h2}-M_0-$; $-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-$, $-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h2}-M_0-$,

$-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-$, or $-(C_2H_4O)_{h1}-CH_2-CH(OH)-CH_2-O-M_0-$; $G_3$ is a divalent radical of $-G_4VC\hat{}C'H-CH_2-S-JO-S-CH_2-\overset{R_0}{CH}-(\overset{O}{\overset{\|}{C}})_{h4}-G_2-$ (O, $R_n$, $h3$) in which h3 and h4 independent of each other are 1 or 0, G4 is a divalent radical of any one of (a) $-NR_3-$ in which $R_3$ is hydrogen or $C_1$-$C_3$ alkyl, (b) $-N\langle\rangle N-$ (piperazine-1,4-diyl), (c) $-NR''-G_5-NR''-$ in which R'' is hydrogen or methyl and $G_5$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical, and (d) $-O-G_6-O-$ in which $G_6$ is a $C_1$-$C_6$ alkylene divalent radical, a divalent radical of $-(CH_2-\overset{OH}{CH}-CH_2-O)_{h4}-CH_2-\overset{OH}{CH}-CH_2-$ in which h4 is 1 or 2, a divalent radical of $-CH_2-\overset{OH}{CH}-CH_2-O-CH_2-CH_2-O-CH_2-\overset{OH}{CH}-CH_2-$, a divalent radical of $-(CH_2-CH_2-O)_{h5}-CH_2-CH_2-$ in which h5 is an integer of 1 to 5, a divalent radical of $-(CH_2)_{h6}-O-\overset{O}{\overset{\|}{\underset{OH}{P}}}-O-(CH_2)_{m5}-$ in which h6 is 2 or 3, or a substituted **$C_3$-$C_8$** alkylene divalent radical having a hydroxyl group or phosphonyloxy group.

28. The silicone hydrogel contact lens of any one of embodiments 1 to 27, wherein the siloxane-containing vinylic monomer is a mono-(meth)acryloyl-terminated, monoalkyl-terminated polysiloxane of formula (I)

$$H_2C=\overset{R_o}{C}-\overset{O}{\overset{\|}{C}}-X_0-L_1-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{n1}-\underset{CH_3}{\overset{CH_3}{Si}}-R_{t1} \qquad (I)$$

in which: $R_0$ is H or methyl; $X_0$ is O or $NR_1$; $L_1$ is a $C_3$-$C_8$ alkylene divalent radical or a divalent radical of $-L_1'-X_1-L_1''-$, $-(C_2H_4O)_{q1}-L_1''-$, $-(C_2H_4O)_{q1}-CONH-L_1''-$,

$-L_1'-NHCOO-(C_2H_4O)_{q1}-L_1''-$, $-CH_2-CH(OH)-CH_2-X_1'-(C_2H_4O)_{q2}-L_1''-$,

$-L_1'-X_1'-CH_2-CH(OH)-CH_2-O-L_1''-$, or $-(C_2H_4O)_{q1}-CH_2-CH(OH)-CH_2-O-L_1''-$; $L_1'$ is a $C_2$-$C_8$

alkylene divalent radical which has zero or one hydroxyl group; $L_1$" is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, CONR1, or NR1 CO; $R_1$ is H or a C1-C4 alkyl having 0 to 2 hydroxyl group; $R_{t1}$ is a C1-C4 alkyl; $X_1$' is O or NRi ; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; n1 is an integer of 3 to 25 (preferably 3 to 20, more preferably 3 to 15, even more preferably 3 to 10).

29. The silicone hydrogel contact lens of embodiment 28, wherein the mono-(meth)acryloyl-terminated , monoalkyl-terminated polysiloxane is a-(meth)acryloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloxy-2-hydroxypropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(2-hydroxyl-methacryloxypropyloxypropyl)-u-butyl-decamethylpentasiloxane, α-[3-(meth)acryloxyethoxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxypropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxyisopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxybutyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxyethylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxypropylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxybutylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloxy(polyethylenoxy)-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyloxy-ethoxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyl-N-ethylaminopropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyl-aminopropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyloxy(polyethylenoxy)propyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloylamidopropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-N-methyl-(meth)acryloylamidopropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidoethoxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or u-methyl) polydimethylsiloxane, a-[3-(meth)acrylamidopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidoisopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidobutyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl)

terminated polydimethylsiloxane, a-[3-(meth)acryloylamido-2-hydroxypropyloxypropyl] terminated ω-butyl (or ω-methyl) polydimethylsiloxane, a-[3-[N-methyl-(meth)acryloylamido]-2-hydroxypropyloxypropyl] terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, N-methyl-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, N-(2,3-dihydroxypropane)-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, (meth)acryloylamidopropyltetra(dimethylsiloxy)dimethylbutylsilane, or a mixture thereof.

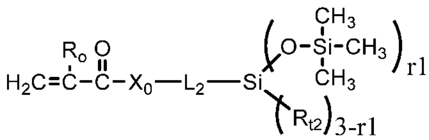
30. The silicone hydrogel contact lens of embodiment 28 or 29, wherein in formula (I) n1 is an integer of 3 to 20.

31. The silicone hydrogel contact lens of embodiment 28 or 29, wherein in formula (I) n1 is an integer of 3 to 15.

32. The silicone hydrogel contact lens of embodiment 28 or 29, wherein in formula (I) n1 is an integer of 3 to 10.

33. The silicone hydrogel contact lens of any one of embodiments 1 to 27, wherein the siloxane containing vinylic monomers is a vinylic monomer containing a tris(trimethylsilyloxy)silyl or bis(trimethylsilyloxy)alkylsilyl group.

34. The silicone hydrogel contact lens of embodiment 33, wherein the siloxane-containing vinylic monomer is a tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer of formula (II)



(II)

in which: $R_0$ is H or methyl; $X_0$ is O or $NR_1$; $L_2$ is a $C_3$-$C_8$ alkylene divalent radical or a divalent radical of or -L2'-X2-L2"-, -(C $_2H_40)_q$i-L2"-, -(C2H$_40)_q$i-CONH-L2"-; or - $L_2$'-NHCOO-(C2H$_4$0)qi-L2"-, $L_2$' is a $C_2$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_2$" is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, $CONR_1$, or $NR_1CO$; $R_1$ is H or a $C_1$-$C_4$ alkyl having 0 to 2 hydroxyl group; $R_{t2}$ is a Ci-$C_4$ alkyl; q1 is an integer of 1 to 20, r1 is an integer of 2 or 3.

35. The silicone hydrogel contact lens of embodiment 33 or 34, wherein the tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer is selected from the group consisting of tris(trimethylsilyloxy)silylpropyl (meth)acrylate, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy) methylsilane, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)butylsilane, 3-(meth)acryloxy-2-(2-hydroxyethoxy)-propyloxy)propylbis(trimethylsiloxy)methylsilane, N-[tris(trimethylsiloxy)silylpropyl]-(meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)-methylsilyl)propyloxy)propyl)-2-methyl (meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl) (meth)acrylamide, N-(2-hydroxy-3-(3-

(tris(trimethylsilyloxy)silyl)propyloxy)propyl)-2-methyl acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl) (meth)acrylamide, and mixtures thereof.

36. The silicone hydrogel contact lens of any one of embodiments 1 to 35, wherein the hydrophilic N-vinyl amide monomer is N-vinylpyrrolidone, N-vinyl piperidone, N-vinyl caprolactam, N-vinyl-N-methyl acetamide, N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, N-vinyl-N-ethyl acetamide, N-vinyl-N-ethyl formamide, and mixtures thereof.

37. The silicone hydrogel contact lens of any one of embodiments 1 to 35, wherein the hydrophilic N-vinyl amide monomer is N-vinylpyrrolidone, N-vinyl-N-methyl acetamide, or combinations thereof.

38. The silicone hydrogel contact lens of any one of embodiments 1 to 37, wherein the silicone hydrogel contact lens further comprises repeating units of one or more non-silicone vinylic crosslinking agents.

39. The silicone hydrogel contact lens of embodiment 38, wherein said one or more non-silicone vinylic crosslinking agents are selected from the group consisting of ethyleneglycol di-(meth)acrylate, diethyleneglycol di-(meth)acrylate, triethyleneglycol di-(meth)acrylate, tetraethyleneglycol di-(meth)acrylate, glycerol di-(meth)acrylate, 1,3-propanediol di-(meth)acrylate, 1,3-butanediol di-(meth)acrylate, 1,4-butanediol di-(meth)acrylate, glycerol 1,3-diglycerolate di-(meth)acrylate, ethylenebis[oxy(2-hydroxypropane-1 ,3-diyl)] di-(meth)acrylate, bis[2-(meth)acryloxyethyl] phosphate, trimethylolpropane di-(meth)acrylate, and 3,4-bis[(meth)acryloyl]tetrahydrofuan, diacrylamide, dimethacrylamide, N,N-di(meth)acryloyl-N-methylamine, N,N-di(meth)acryloyl-N-ethylamine, N,N'-methylene bis(meth)acrylamide, N,N'-ethylene bis(meth)acrylamide, N,N'-dihydroxyethylene bis(meth)acrylamide, N,N'-propylene bis(meth)acrylamide, N,N'-2-hydroxypropylene bis(meth)acrylamide, N,N'-2,3-dihydroxybutylene bis(meth)acrylamide, 1,3-bis(meth)acrylamidepropane-2-yl dihydrogen phosphate, piperazine diacrylamide, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, triallyl cyanurate, trimethylopropane trimethacrylate, pentaerythritol tetramethacrylate, bisphenol A dimethacrylate, and combinations thereof.

40. The silicone hydrogel contact lens of embodiment 39, wherein said one or more non-silicone vinylic crosslinking agents are selected from the group consisting of tetra(ethyleneglycol) di-(meth)acrylate, tri(ethyleneglycol) di-(meth)acrylate, ethyleneglycol di-(meth)acrylate, di(ethyleneglycol) di-(meth)acrylate, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, or triallyl cyanurate.

41. The silicone hydrogel contact lens of any one of embodiments 38 to 40, wherein the

silicone hydrogel contact lens comprise about 1.0% or less by weight of repeating units of said one or more non-silicone vinylic crosslinking agents, relative to the dry weight of the silicone hydrogel contact lens.

42. The silicone hydrogel contact lens of any one of embodiments 38 to 40, wherein the silicone hydrogel contact lens comprise about 0.8% or less by weight of repeating units of said one or more non-silicone vinylic crosslinking agents, relative to the dry weight of the silicone hydrogel contact lens.

43. The silicone hydrogel contact lens of any one of embodiments 38 to 40, wherein the silicone hydrogel contact lens comprise from about 0.05% to about 0.6% by weight of repeating units of said one or more non-silicone vinylic crosslinking agents, relative to the dry weight of the silicone hydrogel contact lens.

44. The silicone hydrogel contact lens of any one of embodiments 1 to 43, wherein the silicone hydrogel contact lens further comprises repeating units of a blending vinylic monomer.

45. The silicone hydrogel contact lens of embodiment 44, wherein the blending vinylic monomer is a $C_1$-$C_{10}$ alkyl (meth)acrylate, cyclopentylacrylate, cyclohexylmethacrylate, cyclohexylacrylate, isobornyl (meth)acrylate, styrene, 4,6-trimethylstyrene (TMS), t-butyl styrene (TBS), trifluoroethyl (meth)acrylate, hexafluoro-isopropyl (meth)acrylate, hexafluorobutyl (meth)acrylate, or combinations thereof.

46. The silicone hydrogel contact lens of embodiment 44, wherein the blending vinylic monomer is methyl methacrylate.

47. The silicone hydrogel contact lens of any one of embodiments 44 to 46, wherein the silicone hydrogel contact lens comprises about 25% or less by weight of repeating units of the blending vinylic monomer, relative to the dry weight of the silicone hydrogel contact lens.

48. The silicone hydrogel contact lens of any one of embodiments 44 to 46, wherein the silicone hydrogel contact lens comprises about 20% or less by weight of repeating units of the blending vinylic monomer, relative to the dry weight of the silicone hydrogel contact lens.

49. The silicone hydrogel contact lens of any one of embodiments 44 to 46, wherein the silicone hydrogel contact lens comprises about 15% or less by weight of repeating units of the blending vinylic moonmer, relative to the dry weight of the silicone hydrogel contact lens.

50. The silicone hydrogel contact lens of any one of embodiments 1 to 49, wherein the silicone hydrogel contact lens further comprises repeating units of at least one UV-absorbing vinylic monomer.

51. The silicone hydrogel contact lens of any one of embodiment 50, wherein the silicone hydrogel contact lens further comprises repeating units of at least one UV/HEVL-absorbing vinylic monomer.

52. The silicone hydrogel contact lens of any one of embodiments 1 to 51, wherein the

silicone hydrogel contact lens further comprises repeating units of 2-[2'-hydroxy-5'-(2-methacryloxyethyl)phenyl)]-2H-benzotriazole (Norbloc) and repeating units of at least one UV/HEVL-absorbing vinylic monomer selected from the group consisting of 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-2/-/-benzotriazole, 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-methoxy-2/-/-benzotriazole (UV1 3), 2-{2'-Hydroxy-3'-fe/if-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-chloro-2/-/-benzotriazole (UV28), 2-[2'-Hydroxy-3'-fe/f-butyl-5'-(3'-acryloyloxypropoxy)phenyl]-5-trifluoromethyl-2/-/-benzotriazole (UV23), and combinations thereof.

53. The silicone hydrogel contact lens of any one of embodiments 1 to 52, wherein the silicone hydrogel contact lens is characterized by having a UVB transmittance of about 10% or less between 280 and 315 nanometers and a UVA transmittance of about 30% or less between 315 and 380 nanometers and and a Violet transmittance of about 70% or less between 380 nm and 440 nm.

54. The silicone hydrogel contact lens of embodiment 53, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 5% or less between 280 and 315 nanometers.

55. The silicone hydrogel contact lens of embodiment 53, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 2.5% or less between 280 and 315 nanometers.

56. The silicone hydrogel contact lens of embodiment 53, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 1% or less between 280 and 315 nanometers.

57. The silicone hydrogel contact lens of any one of embodiments 53 to 56, wherein the silicone hydrogel contact lens is characterized by having the UVA transmittance of about 20% or less between 315 and 380 nanometers.

58. The silicone hydrogel contact lens of any one of embodiments 53 to 56, wherein the silicone hydrogel contact lens is characterized by having the UVA transmittance of about 10% or less between 315 and 380 nanometers.

59. The silicone hydrogel contact lens of any one of embodiments 53 to 56, wherein the silicone hydrogel contact lens is characterized by having the UVA transmittance of about 5% or less between 315 and 380 nanometers.

60. The silicone hydrogel contact lens of any one of embodiments 53 to 59, wherein the silicone hydrogel contact lens is characterized by having the Violet transmittance of about 60% or less between 380 nm and 440 nm.

61. The silicone hydrogel contact lens of any one of embodiments 53 to 59, wherein the silicone hydrogel contact lens is characterized by having the Violet transmittance of about 50% or less, even more preferably about 40% or less) between 380 nm and 440 nm.

62. The silicone hydrogel contact lens of any one of embodiments 53 to 59, wherein the silicone hydrogel contact lens is characterized by having the Violet transmittance of about 40% or less between 380 nm and 440 nm.

63. The silicone hydrogel contact lens of any one of embodiments 1 to 62, wherein the silicone hydrogel contact lens further comprises repeating units of one or more hydrophilic acrylic monomers selected from the group consisting of N,N-dimethyl (meth)acrylamide, (meth)acrylamide, N-hydroxylethyl (meth)acrylamide, N-hydroxypropyl (meth)acrylamide, hydroxyethyl (meth)acrylate, glycerol methacrylate (GMA), polyethylene glycol (meth)acrylate having a number average molecular weight of up to 1500, polyethylene glycol $C_1$-$C_4$-alkyl ether (meth)acrylate having a number average molecular weight of up to 1500, /V-[tris(hydroxymethyl)methyl]-acrylamide, (meth)acrylic acid, ethylacrylic acid, and combinations thereof

64. The silicone hydrogel contact lens of any one of embodiments 1 to 63, wherein the silicone hydrogel contact lens further comprises repeating units of one or more hydrophilic acrylic monomers selected from the group consisting of N,N-dimethyl (meth)acrylamide, hydroxyethyl (meth)acrylate, N-hydroxylethyl (meth)acrylamide, glycerol methacrylate (GMA), and combinations thereof.

65. The silicone hydrogel contact lens of embodiment 63 or 64, wherein the silicone hydrogel contact lens comprises about 10% or less by weight of repeating units of said one or more hydrophilic acrylic monomers, relative to the dry weight of the silicone hydrogel contact lens.

66. The silicone hydrogel contact lens of embodiment 63 or 64, wherein the silicone hydrogel contact lens comprises about 8% or less by weight of repeating units of said one or more hydrophilic acrylic monomers, relative to the dry weight of the silicone hydrogel contact lens.

67. The silicone hydrogel contact lens of embodiment 63 or 64, wherein the silicone hydrogel contact lens comprises about 5% or less by weight of repeating units of said one or more hydrophilic acrylic monomers, relative to the dry weight of the silicone hydrogel contact lens.

68. The silicone hydrogel contact lens of any one of embodiments 1 to 67, wherein the silicone hydrogel contact lens comprises about 60% or more by weight of the first, second, and third repeating units together, relative to the dry weight of the silicone hydrogel contact lens.

69. The silicone hydrogel contact lens of any one of embodiments 1 to 67, wherein the the silicone hydrogel contact lens comprises about 65% or more by weight of the first, second, and third repeating units together, relative to the dry weight of the silicone hydrogel contact lens.

70. The silicone hydrogel contact lens of any one of embodiments 1 to 67, wherein the the silicone hydrogel contact lens comprises about 70% or more by weight of the first, second, and third repeating units together, relative to the dry weight of the silicone hydrogel contact lens.

71. The silicone hydrogel contact lens of any one of embodiments 1 to 67, wherein the the silicone hydrogel contact lens comprises about 75% or more by weight of the first, second, and third repeating units together, relative to the dry weight of the silicone hydrogel contact lens.

72. A method for producing inherently-wettable silicone hydrogel contact lenses, comprising the steps of: (1) preparing a polymerizable composition which is clear at room temperature, wherein the polymerizable composition comprises (a) at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties, (b) at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having one or more second H-donor moieties, (c) at least one hydrophilic N-vinyl amide monomer, (d) optionally at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties, and (e) at least one free radical initiator, wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker, wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of -NHR°, amino linkages of -NH-, amide linkages of -CONH- , urethane linkages of -OCONH-, or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl, wherein the polymerizable composition comprises at least 8.8 mmoles of component (c) per gram of all components (a), (b) and (d) in total (i.e., $\frac{[\text{component (c)}]\ \text{mmole}}{([\text{component (a)}] + [\text{component (b)}] + [\text{component (d)}])\ \text{g}} \geq$ **8.8 mmole/ g**) and at least 0.11 meqs of the first, second and third H-donor moieties in total per gram of component (c) (i.e., $\frac{[\text{1st H-D}]+[\text{2nd H-D}]+[\text{3rd H-D}]\ \text{meq}}{[\text{component (c)}]\ \text{g}} \geq 0.11\ \text{meq/g}$); (2) introducing the polymerizable composition into a lens mold; and (3) curing thermally or actinically the polymerizable composition in the lens mold to form a silicone hydrogel contact lens, wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers, an elastic modulus of from about 0.2 MPa to about 1.5 MPa, and an equilibrium water content of from about 40% to about 70% and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds and a water contact angle by captive bubble of about 80 degrees or less without being subjected to any post-curing surface treatment.

73. The method of embodiment 72, wherein the polymerizable composition comprises at least 9.0 mmolesof component (c) per gram of all components (a), (b) and (d) in total.

74. The method of embodiment 72, wherein the polymerizable composition comprises at least 9.2 mmoles of component (c) per gram of all components (a), (b) and (d) in total.

75. The method of embodiment 72, wherein the polymerizable composition comprises at least 9.6 mmoles of component (c) per gram of all components (a), (b) and (d) in total.

76. The method of any one of embodiments 72 to 75, wherein the polymerizable composition comprises at least 0.1 5 meqs of the first, second and third H-donor moieties in total per gram of component (c).

77. The method of any one of embodiments 72 to 75, wherein the polymerizable composition comprises at least 0.20 meqs of the first, second and third H-donor moieties in total per gram of component (c).

78. The method of any one of embodiments 72 to 75, wherein the polymerizable composition comprises at least 0.25 meqs of the first, second and third H-donor moieties in total per gram of component (c).

79. The method of any one of embodiments 72 to 78, wherein the silicone hydrogel contact lens has a water-break-up-time of at least 15 seconds without being subjected to any post-curing surface treatment.

80. The method of any one of embodiments 72 to 78, wherein the silicone hydrogel contact lens has a water-break-up-time of at least 20 seconds without being subjected to any post-curing surface treatment.

81. The method of any one of embodiments 72 to 80, wherein the silicone hydrogel contact lens has a water contact angle by captive bubble of about 75 degrees or less without being subjected to any post-curing surface treatment.

82. The method of any one of embodiments 72 to 80, wherein the silicone hydrogel contact lens has a water contact angle by captive bubble of about 70 degrees or less without being subjected to any post-curing surface treatment.

83. The method of any one of embodiments 72 to 80, wherein the silicone hydrogel contact lens has a water contact angle by captive bubble of about 65 degrees or less without being subjected to any post-curing surface treatment.

84. The method of any one of embodiments 72 to 83, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 60 barrers.

85. The method of any one of embodiments 72 to 83, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 70 barrers.

86. The method of any one of embodiments 72 to 83, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 80 barrers.

87. The method of any one of embodiments 72 to 83, wherein the silicone hydrogel contact lens has an oxygen permeability of at least about 100 barrers.

88. The method of any one of embodiments 72 to 87, wherein the silicone hydrogel

contact lens has an equilibrium water content of from about **43%** to about **65%** by weight.

**89.** The method of any one of embodiments **72** to **87,** wherein the silicone hydrogel contact lens has an equilibrium water content of from about **45%** to about **60%** by weight.

**90.** The method of any one of embodiments **72** to **89,** wherein the silicone hydrogel contact lens has an elastic modulus of from about **0.3** MPa to about **1.2** MPa or less.

**91.** The method of any one of embodiments **72** to **89,** wherein the silicone hydrogel contact lens has an elastic modulus of from about **0.4** MPa to about **1.0** MPa or less.

**92.** The method of any one of embodiments **72** to **89,** wherein the linear chain-extended polysiloxane vinylic crosslinker has a number average molecular weight of from about **4000** to about **40000** Daltons.

**93.** The method of any one of embodiments **72** to **91,** wherein the linear chain-extended polysiloxane vinylic crosslinker has a number average molecular weight of from about **5000** to about **20000** Daltons.

**94.** The method of any one of embodiments **72** to **92,** wherein the the linear polysiloxane vinylic crosslinker comprises two terminal (meth)acryloyl groups and from **2** to **20** polysiloxane segments each pair of which are linked via an organic radical having at least two H-donor moieties selected from group consisting of urethane linkage of -OCONH- , hydroxyl groups, carboxyl groups, amino groups of -NHR $^0$, amino linkages of -NH- , amide linkages of -CONH- , and combinations thereof, wherein the polysiloxane vinylic crosslinker.

**95.** The method of any one of embodiments **72** to **94,** wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula **(1)**

$$E_1-\left[\underset{CH_3}{\overset{CH_3}{Si}}-O-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 1}-L_3\right]_{\omega 1}-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 1}-\underset{CH_3}{\overset{CH_3}{Si}}-E_1 \qquad (1)$$

in which: $\upsilon$**1** is an integer of from **5** to **50** and $\omega$**1** is an integer of from **1** to **15**; $L_3$ is a divalent radical of $-L_3'-O-(C_2H_4O)_{q1}-CONH-R_2-\{NHCO-PE-CONH-R_2\}_{g1}-NHCO-(OC_2H_4)_{q1}-O-L_3'-$ ; PE is a divalent radical of $-(CH_2CH_2O)_{q3}-Z_0-CF_2-(OCF_2)_x-(OCF_2CF_2)_y-OCF_2-Z_0-(OCH_2CH_2)_{q3}-$ or

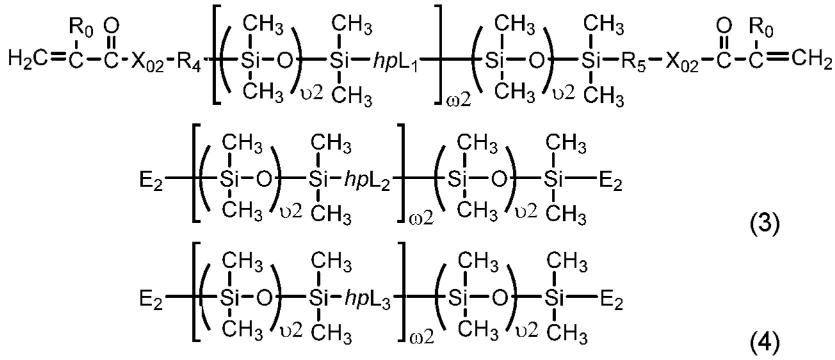
$$-Z_0-(CH_2CH_2O)_{q4}-\left(CH_2-\overset{CH_3}{CH}-O\right)_{q5}-\left(CH_2-\overset{C_2H_5}{CH}-O\right)_{q6}-Z_0-$$

; $E_1$ is a monovalent radical of $H_2C=\overset{R_0}{C}-\overset{O}{\overset{\|}{C}}-X_{01}-L_4-$ ; $L_4$ is a divalent radical of $-C_2H_4-NHCO-O-(C_2H_4O)_{q2}-L_3'-$,

$-(C_2H_4O)_{q1}-CONH-R_2-NHCO-O-(C_2H_4O)_{q2}-L_3'-$, $-R_3-O-CONH-R_2-NHCO-O-(C_2H_4O)_{q2}-L_3'-$,

$-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{q2}-L_3'-$, or $-(C_2H_4O)_{q2}-L_3'-$ ; $R_0$ is **H or** methyl; $X_{01}$ is **O or** $NR_{n1}$; $R_{n1}$ is H or a C1-C10 alkyl; $R_2$ is a $C_4$-$C_{14}$ hydrocarbon divalent radical; $R_3$ is a $C_2$-$C_6$ alkylene divalent radical; $L_3'$ is $C_3$-$C_8$ alkylene divalent radical; $Z_0$ is a direct bond or a C1-C12 alkylene divalent radical; g1 is 1 or zero; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; q3 is an integer of 0 to 2; q4 is an integer of 2 to 50, q5 and q6 independent of each other are a number of 0 to 35; provided that (q4+q5+q6) is an integer of 2 to 50; x+y is an integer of from 10 to 30.

96. The method of any one of embodiments 72 to 94, wherein the linear chain-extended polysiloxane vinylic crosslinker is represented by formula (2), (3) or (4)

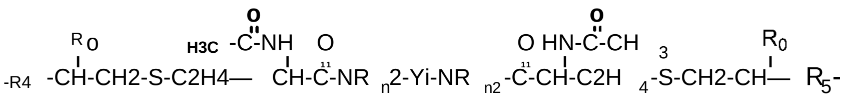


(2)

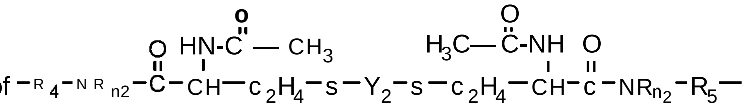
(3)

(4)

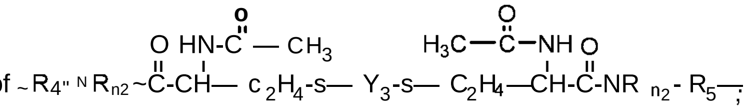
in which: *hp*L1 is a divalent radical of

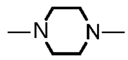
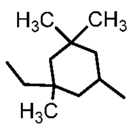
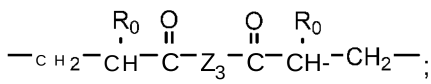
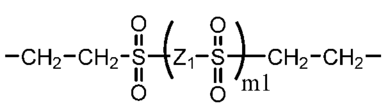
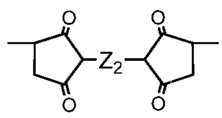


; *hp*L2 is a divalent radical of

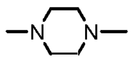


; *hp*L3 is a divalent radical of



; $Y_1$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, a divalent radical of , or a divalent radical of ; $Y_2$ is a divalent radical of ; $Y_3$ is a divalent radical of  or ; $Z_1$ is a $C_1$-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted Ci-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical; $Z_2$ is a Ci-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted Ci-$C_6$ alkylene divalent radical, a dihydroxyl- or dimethoxy-substituted $C_2$-$C_6$ alkylene divalent radical, a divalent radical of -

$C2H4$-(0-C2H $_{4})m2$-, a divalent radical of - $Z_4$-S-S-Z $_4$- , a hydroxyl- or methoxy-substituted Ci-C $_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical;

$Z_3$ is a divalent radical of any one of (a) -NR $_{n3}$- , (b) , (c) -NRo-Z $_5$-NR $_0$- , and (d) - O- Z6- O- ; $Z_4$ is a C1-C6 alkylene divalent radical; Zs is a C1-C6 alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical; $Z_6$ is (a) a Ci-C $_6$ alkylene divalent radical, (b) a divalent radical of -(CH$_2$-c?H-CH $_2$-o)-CH¾3 $_2$-(?H-CH $_2$- ,

— CH2- CH(OH)−CH$_2$−O−CH$_2$−CH$_2$−O−CH$_2$−CH(OH)−CH$_2$—, —(CH$_2$−CH$_2$−O)$_{m4}$−CH$_2$−CH$_2$—,

—(CH$_2$)$_{m5}$—0 - P(O)(OH) - 0 -(CH$_2$)$_{m5}$—, or (c) a substituted $C_3$-$C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group; $Z_7$ is a divalent radical of

−Z$_3$−C(O)-CH(R$_0$)−CH$_2$−S−C$_2$H$_4$−CH(NH-C(O)-CH$_3$)−C(O)- NR$_{n2}$−R$_4$-; Z8 is a divalent radical of

-Z9 -C(O)-CH(R$_0$)-CH2-S **-C2H4**-CH(NH-C(O)-CH$_3$)— C(O)**-NR**$_{n2}$-F¾,-; **$E_2$** is a monovalent radical of

$H_2C$=C(R$_0$)−C(O)-Z$_7$—; υ2 is an integer of from 5 to 50; ω2 is an integer of from 1 to 15; X02 is O or NRn2; Ro is hydrogen or methyl; $R_{n2}$ is hydrogen or d-GValkyl; $R_{n3}$ is hydrogen or C1-C3 alkyl; $R_4$ and R 5 independent of each other are a C1-C6 alkylene divalent radical or a C1-C6 alkylene-oxy-Ci-C $_6$ alkylene divalent radical; ml is 0 or 1, m2 is an integer of 1 to 6, m3 is 1 or 2, m4 is an integer of 1 to 5, m5 is 2 or 3.

97. The method of any one of embodiments 72 to 94, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (5)

$$E_3-\left[R_6-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 3}-\underset{CH_3}{\overset{CH_3}{Si}}-R_2-hpL_4-\text{pOAlk}-hpL_4\right]_{\omega 3}-R_6-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 3}-\underset{CH_3}{\overset{CH_3}{Si}}-R_7-E_3 \quad (5)$$

in which: υ3 is an integer of from 5 to 50; ω3 is an integer of from 1 to 15; E3 is a monovalent radical of $H_2C$=C(R$_0$)-C(O)-X$_{03}$— in which $R_0$ is hydrogen or methyl, $X_{03}$ is O or $NR_{n4}$, and $R_{n4}$ is hydrogen or d-GValkyl; $R_6$ and $R_7$ independent of each other are a GVC$_6$ alkylene divalent radical or a GVC$_6$ alkoxy-CrC $_6$ alkylene divalent radical; pOAlk is a divalent radical of $-(EO)_{e1}(PO)_{p1}(BO)_{b1}-$ in which EO is an oxyethylene unit (-CH2CH2O-), PO is an oxypropylene unit ( $-CH_2-CH(CH_3)-O-$ ), and BO is an oxybutylene unit ( $-CH_2-CH(C_2H_5)-O-$ ), e1 is an integer of 5 to 100, p1 and b1 independent of each other are an integer of 0 to 50, provided that (e1 +p1 +b1 )>1 0 and $e1/(p1+b1) \geq 2$ (preferably from about 2:1 to about 10:1, more preferably from about 3:1 to about 6:1 ) when (p1 +b1 )>1 ; hp $L_4$ is a divalent radical of

$$-X_{03}-C(=O)-CH(R_0)-CH_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n4}-R_8-$$ or

$$-R_9-NR_{n4}-C(=O)-CH(NH-C(=O)-CH_3)-C_2H_4-S-CH_2-CH(R_0)-C(=O)-X_{03}-$$ in which $R_8$ and $R_9$ independent of each other are a substituted or unsubstituted C1-C12 alkylene divalent radical.

98. The method of any one of embodiments 72 to 94, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (6)

$$E_4-\left[\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon4}-\underset{CH_3}{\overset{CH_3}{Si}}-G_1-CH_2-\overset{R_0}{CH}-S-J_0-S-\overset{R_0}{CH}-CH_2-G_1\right]_{\omega4}-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon4}-\underset{CH_3}{\overset{CH_3}{Si}}-E_4 \quad (6)$$

in which: v4 is an integer from 5 to 100; ω4 is an integer of 1 to 15; $R_0$ is hydrogen or methyl; $J_0$ is a C1-C12 hydrocarbon radical having 0 to 2 hydroxyl or carboxyl groups; G1 is a direct bond, a $C_1$-$C_4$ alkylene divalent radical, or a bivalent radical of

$-X_{04}-(C_2H_4O)_{h1}-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$ , $-X_{05}-M_2-O-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$ ,

$-X_{06}-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-$ , $-X_{07}-(C_2H_4O)_{h2}-M_0-$ ;

$-X_{08}-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-$ , $-X_{10}-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h2}-M_0-$ ,

$-X_{07}-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-$ , or $-X_{08}-(C_2H_4O)_{h1}-CH_2-CH(OH)-CH_2-O-M_0-$ in which h1 is an integer of 1 to 20; h2 is an integer of 0 to 20; $M_0$ is $C_3$-$C_8$ alkylene divalent radical; $M_1$ is a C4-C14 hydrocarbon divalent radical; $M_2$ and $M_3$ independent of each other are a $C_1$-$C_6$ alkylene divalent radical; $X_{04}$ is -COO- or -CONRns-; Rns is H or a C1-C10 alkyl; $X_{05}$ and $X_{07}$ independent of each other are a direct bond, -COO- or -CONRns-; $X_{06}$ is a direct bond, a $C_1$-$C_6$ alkylene divalent radical, a $C_1$-$C_6$ alkylenoxy divalent radical, -COO-, or -CONRn5-; $X_{08}$ is a direct bond or -COO-; $X_{09}$ is O or $NR_{n5}$; $X_{10}$ is a direct bond, a $C_1$-$C_6$ alkylene divalent radical, -COO-, or -CONRns-; Provided that $M_0$ is linked to Si atom while $X_{04}$ to $X_{10}$ are linked to the group of $-CH_2-$ in formula (6) and that at least one of $J_1$ and G1 comprises at least one moieties selected from the group consisting of hydroxyl groups, urethane linkage of -OCONH-, amino groups of -NHR $^0$, amino linkages of -NH- , amide linkages of -CONH- , carboxyl groups, and combinations thereof; $E_4$ is a monovalent radical of $H_2C{=}\overset{R_0}{C}{-}\overset{O}{C}{-}X_{11}{-}G_2{-}$ or $H_2C{=}\overset{R_0}{C}{-}\overset{O}{C}{-}G_3{-}$; $X_{11}$ is O or $NR_{n5}$; $G_2$ is a $C_1$-$C_4$ alkylene divalent radical or a bivalent radical of $-(C_2H_4O)_{h1}-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$ , $-M_2-O-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$ , $-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-$ , $-(C_2H_4O)_{h2}-M_0-$ ; $-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-$ , $-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h}-M_0-$ , $-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-$ , or $-(C_2H_4O)_{h}-CH_2-CH(OH)-CH_2-O-M_0-$ ; $G_3$ is a divalent radical of $-G_4-\left(\overset{O}{C}\right)_{h3}-\overset{R_0}{CH}-CH_2-S-J_0-S-CH_2-\overset{R_0}{CH}-\left(\overset{O}{C}\right)_{h4}-G_2-$ in which h3 and h4 independent of each other are 1 or 0, G4 is a divalent radical of any one of (a) $-NR_3-$ in which $R_3$ is hydrogen or $C_1$-$C_3$ alkyl, (b) $-N\langle\rangle N-$ (piperazin-1,4-diyl), (c) $-NR''-G_5-NR''-$ in which R'' is hydrogen or methyl and $G_5$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical, and (d) -O-G6-O- in which $G_6$ is a $C_1$-$C_6$ alkylene divalent radical, a divalent radical of $-\left(CH_2-\overset{OH}{CH}-CH_2-O\right)_{h4}-CH_2-\overset{H}{C}-CH_2-$ in which h4 is 1 or 2, a divalent radical of $-CH_2-\overset{OH}{CH}-CH_2-O-CH_2-CH_2-O-CH_2-\overset{OH}{CH}-CH_2-$ , a divalent radical of $-\left(CH_2-CH_2-O\right)_{h5}-CH_2-CH_2-$ in which h5 is an integer of 1 to 5, a divalent radical of $-\left(CH_2\right)_{h6}-O-\overset{O}{\underset{OH}{P}}-O-\left(CH_2\right)_{m5}-$ in which h6 is 2 or 3, or a substituted $C_3$-$C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group.

99. The method of any one of embodiments 72 to 98, the siloxane-containing vinylic monomer is a mono-(meth)acryloyl-terminated, monoalkyl-terminated polysiloxane of formula (I)

$$H_2C{=}\overset{R_0}{C}{-}\overset{O}{C}{-}X_0{-}L_1{-}\left(\underset{CH_3}{\overset{CH_3}{Si}}{-}O\right)_{n1}{-}\underset{CH_3}{\overset{CH_3}{Si}}{-}R_{t1} \qquad (I)$$

in which: $R_0$ is H or methyl; $X_0$ is O or $NR_1$; $L_1$ is a $C_3$-$C_8$ alkylene divalent radical or a divalent radical of $-L_1'-X_1-L_1''-$ , $-(C_2H_4O)_{q1}-L_1''-$ , $-(C_2H_4O)_{q1}-CONH-L_1''-$ ,

$-L_1'-NHCOO-(C_2H_4O)_{q1}-L_1''-$, $-CH_2-CH(OH)-CH_2-X_1'-(C_2H_4O)_{q2}-L_1''-$,

$-L_1'-X_1'-CH_2-CH(OH)-CH_2-O-L_1''-$, or $-(C_2H_4O)_{q1}-CH_2-CH(OH)-CH_2-O-L_1''-$; $L_1'$ is a $C_2$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_1''$ is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, CONR1, or NR1 CO; $R_1$ is H or a C1-C4 alkyl having 0 to 2 hydroxyl group; $R_{t1}$ is a C1-C4 alkyl; $X_1'$ is O or $NR_1$; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; n1 is an integer of 3 to 25.

100. The method of embodiment 99, wherein the mono-(meth)acryloyl-terminated, monoalkyl-terminated polysiloxane is a-(meth)acryloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloxy-2-hydroxypropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(2-hydroxyl-methacryloxypropyloxypropyl)-u-butyl-decamethylpentasiloxane, a-[3-(meth)acryloxyethoxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxypropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxyisopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxybutyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxyethylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxypropylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloxybutylamino-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloxy(polyethylenoxy)-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyloxy-ethoxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyl-N-ethylaminopropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyl-aminopropyl]-terminated ω-butyl (or u-methyl) terminated polydimethylsiloxane, a-[(meth)acryloxy-2-hydroxypropyloxy(polyethylenoxy)propyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-(meth)acryloylamidopropyloxypropyl terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-N-methyl-(meth)acryloylamidopropyloxypropyl terminated ω-butyl (or u-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidoethoxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) polydimethylsiloxane, a-[3-(meth)acrylamidopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or u-methyl) terminated polydimethylsiloxane, a-[3-(meth)acrylamidoisopropyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane,

a-[3-(meth)aciylamidobutyloxy-2-hydroxypropyloxypropyl]-terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, a-[3-(meth)acryloylamido-2-hydroxypropyloxypropyl] terminated ω-butyl (or ω-methyl) polydimethylsiloxane, a-[3-[N-methyl-(meth)acryloylamido]-2-hydroxypropyloxypropyl] terminated ω-butyl (or ω-methyl) terminated polydimethylsiloxane, N-methyl-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, N-(2,3-dihydroxypropane)-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, (meth)acryloylamidopropyltetra(dimethylsiloxy)dimethylbutylsilane, or a mixture thereof.

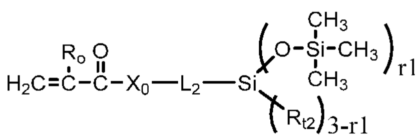
101. The method of embodiment 99 or 100, wherein in formula (I) n1 is an integer of 3 to 20.

102. The method of embodiment 99 or 100, wherein in formula (I) n1 is an integer of 3 to 15.

103. The method of embodiment 99 or 100, wherein in formula (I) n1 is an integer of 3 to 10.

104. The method of any one of embodiments 72 to 98, wherein the siloxane containing vinylic monomers is a vinylic monomer containing a tris(trimethylsilyloxy)silyl or bis(trimethylsilyloxy)alkylsilyl group.

105. The method of embodiment 104, wherein the siloxane-containing vinylic monomer is a tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer of formula (II)


(II)

in which: $R_0$ is H or methyl; $X_0$ is O or $NR_1$; $L_2$ is a $C_3$-$C_8$ alkylene divalent radical or a divalent radical of or -L2'-X2-L2"-, $-(C_2H_40)_q$i-L2"-, $-(C2H_40)_q$i-CONH-L2"-; or - $L_2$'-NHCOO-$(C2H_40)$qi-L2"-, $L_2$' is a $C_2$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_2$" is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, $CONR_1$, or $NR_1CO$; $R_1$ is H or a $C_1$-$C_4$ alkyl having 0 to 2 hydroxyl group; $R_{t2}$ is a Ci-$C_4$ alkyl; q1 is an integer of 1 to 20, r1 is an integer of 2 or 3.

106. The method of embodiment 104 or 105, wherein the tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer is selected from the group consisting of tris(trimethylsilyloxy)silylpropyl (meth)acrylate, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy) methylsilane, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)butylsilane, 3-(meth)acryloxy-2-(2-hydroxyethoxy)-propyloxy)propylbis(trimethylsiloxy)methylsilane, N-[tris(trimethylsiloxy)silylpropyl]-(meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)-methylsilyl)propyloxy)propyl)-2-methyl (meth)acrylamide, N-(2-hydroxy-3-(3-

(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl) (meth)acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl)-2-methyl acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl) (meth)acrylamide, and mixtures thereof.

107. The method of any one of embodiments 72 to 106, wherein the hydrophilic N-vinyl amide monomer is N-vinylpyrrolidone, N-vinyl piperidone, N-vinyl caprolactam, N-vinyl-N-methyl acetamide, N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, N-vinyl-N-ethyl acetamide, N-vinyl-N-ethyl formamide, and mixtures thereof.

108. The method of any one of embodiments 72 to 106, wherein the hydrophilic N-vinyl amide monomer is N-vinylpyrrolidone, N-vinyl-N-methyl acetamide, or combinations thereof.

109. The method of any one of embodiments 72 to 108, wherein the polymerizable composition further comprises one or more non-silicone vinylic crosslinking agents.

110. The method of embodiment 109, wherein said one or more non-silicone vinylic crosslinking agents are selected from the group consisting of ethyleneglycol di-(meth)acrylate, diethyleneglycol di(meth)acrylate, triethyleneglycol di(meth)acrylate, tetraethyleneglycol di-(meth)acrylate, glycerol di(meth)acrylate, 1,3-propanediol di(meth)acrylate, 1,3-butanediol di(meth)acrylate, 1,4-butanediol di(meth)acrylate, glycerol 1,3-diglycerolate di(meth)acrylate, ethylenebis[oxy(2-hydroxypropane-1 ,3-diyl)] di(meth)acrylate, bis[2-(meth)acryloxyethyl] phosphate, trimethylolpropane di(meth)acrylate, and 3,4-bis[(meth)acryloyl]tetrahydrofuan, diacrylamide, dimethacrylamide, N,N-di(meth)acryloyl-N-methylamine, N,N-di(meth)acryloyl-N-ethylamine, N,N'-methylene bis(meth)acrylamide, N,N'-ethylene bis(meth)acrylamide, N,N'-dihydroxyethylene bis(meth)acrylamide, N,N'-propylene bis(meth)acrylamide, N,N'-2-hydroxypropylene bis(meth)acrylamide, N,N'-2,3-dihydroxybutylene bis(meth)acrylamide, 1,3-bis(meth)acrylamidepropane-2-yl dihydrogen phosphate, piperazine diacrylamide, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, triallyl cyanurate, trimethylopropane trimethacrylate, pentaerythritol tetramethacrylate, bisphenol A dimethacrylate, and combinations thereof.

111. The method of embodiment 110, wherein said one or more non-silicone vinylic crosslinking agents are selected from the group consisting of tetra(ethyleneglycol) di-(meth)acrylate, tri(ethyleneglycol) di(meth)acrylate, ethyleneglycol di(meth)acrylate, di(ethyleneglycol) di(meth)acrylate, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, or triallyl cyanurate.

112. The method of any one of embodiments 109 to 111, wherein the polymerizable composition comprise about 1.0% or less by weight of said one or more non-silicone vinylic

crosslinking agents, relative to the total amount of all polymerizable components in the polymerizable composition.

113. The method of any one of embodiments 109 to 111, wherein the polymerizable composition comprise about 0.8% or less by weight of said one or more non-silicone vinylic crosslinking agents, relative to the total amount of all polymerizable components in the polymerizable composition.

114. The method of any one of embodiments 109 to 111, wherein the polymerizable composition comprise from about 0.05% to about 0.6% by weight of said one or more non-silicone vinylic crosslinking agents, relative to the total amount of all polymerizable components in the polymerizable composition.

115. The method of any one of embodiments 72 to 114, wherein the polymerizable composition further comprises a blending vinylic monomer.

116. The method of embodiment 115, wherein the blending vinylic monomer is a $C_1$-$C_{10}$ alkyl (meth)acrylate, cyclopentylacrylate, cyclohexylmethacrylate, cyclohexylacrylate, isobornyl (meth)acrylate, styrene, 4,6-trimethylstyrene (TMS), t-butyl styrene (TBS), trifluoroethyl (meth)acrylate, hexafluoro-isopropyl (meth)acrylate, hexafluorobutyl (meth)acrylate, or combinations thereof.

117. The method of embodiment 115, wherein the blending vinylic monomer is methyl methacrylate.

118. The method of any one of embodiments 115 to 117, wherein the polymerizable composition comprises about 25% or less by weight of the blending vinylic monomer, relative to the total amount of all polymerizable components in the polymerizable composition .

119. The method of any one of embodiments 115 to 117, wherein the polymerizable composition comprises about 20% or less by weight of the blending vinylic monomer, relative to the total amount of all polymerizable components in the polymerizable composition .

120. The method of any one of embodiments 115 to 117, wherein the polymerizable composition comprises about 15% or less by weight of the blending vinylic moonmer, relative to the total amount of all polymerizable components in the polymerizable composition .

121. The method of any one of embodiments 72 to 120, wherein the polymerizable composition further comprises at least one UV-absorbing vinylic monomer.

122. The method of any one of embodiment 121, wherein the polymerizable composition further comprises at least one UV/HEVL-absorbing vinylic monomer.

123. The method of any one of embodiments 72 to 122, wherein the polymerizable composition further comprises 2-[2'-hydroxy-5'-(2-methacryloxyethyl)phenyl)]-2H-

benzotriazole (Norbloc) and at least one UV/HEVL-absorbing vinylic monomer selected from the group consisting of 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-2/-/-benzotriazole, 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-methoxy-2H-benzotriazole (UV1 3), 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-chloro-2H-benzotriazole (UV28), 2-[2'-Hydroxy-3'-fe/?-butyl-5'-(3'-acryloyloxypropoxy)phenyl]-5-trifluoromethyl-2/-/-benzotriazole (UV23), and combinations thereof.

124. The method of any one of embodiments 72 to 123, wherein the silicone hydrogel contact lens is characterized by having a UVB transmittance of about 10% or less between 280 and 315 nanometers and a UVA transmittance of about 30% or less between 315 and 380 nanometers and and a Violet transmittance of about 70% or less between 380 nm and 440 nm.

125. The method of embodiment 124, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 5% or less between 280 and 315 nanometers.

126. The method of embodiment 124, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 2.5% or less between 280 and 315 nanometers.

127. The method of embodiment 124, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 1% or less between 280 and 315 nanometers.

128. The method of any one of embodiments 124 to 127, wherein the silicone hydrogel contact lens is characterized by having the UVA transmittance of about 20% or less between 315 and 380 nanometers.

129. The method of any one of embodiments 124 to 127, wherein the silicone hydrogel contact lens is characterized by having the UVA transmittance of about 10% or less between 315 and 380 nanometers.

130. The method of any one of embodiments 124 to 127, wherein the silicone hydrogel contact lens is characterized by having the UVA transmittance of about 5% or less between 315 and 380 nanometers.

131. The method of any one of embodiments 124 to 130, wherein the silicone hydrogel contact lens is characterized by having the Violet transmittance of about 60% or less between 380 nm and 440 nm.

132. The method of any one of embodiments 124 to 130, wherein the silicone hydrogel contact lens is characterized by having the Violet transmittance of about 50% or less, even more preferably about 40% or less) between 380 nm and 440 nm.

133. The method of any one of embodiments 124 to 130, wherein the silicone hydrogel

contact lens is characterized by having the Violet transmittance of about 40% or less between 380 nm and 440 nm.

134. The method of any one of embodiments 72 to 133, wherein the polymerizable composition further comprises one or more hydrophilic acrylic monomers selected from the group consisting of N,N-dimethyl (meth)acrylamide, (meth)acrylamide, N-hydroxylethyl (meth)acrylamide, N-hydroxypropyl (meth)acrylamide, hydroxyethyl (meth)acrylate, glycerol methacrylate (GMA), polyethylene glycol (meth)acrylate having a number average molecular weight of up to 1500, polyethylene glycol $C_1$-$C_4$-alkyl ether (meth)acrylate having a number average molecular weight of up to 1500, /V-[tris(hydroxymethyl)methyl]-acrylamide, (meth)acrylic acid, ethylacrylic acid, and combinations thereof

135. The method of any one of embodiments 72 to 134, wherein the polymerizable composition further comprises one or more hydrophilic acrylic monomers selected from the group consisting of N,N-dimethyl (meth)acrylamide, hydroxyethyl (meth)acrylate, N-hydroxylethyl (meth)acrylamide, glycerol methacrylate (GMA), and combinations thereof.

136. The method of embodiment 134 or 135, wherein the polymerizable composition comprises about 10% or less by weight of said one or more hydrophilic acrylic monomers, relative to the total amount of all polymerizable components in the polymerizable composition .

137. The method of embodiment 134 or 135, wherein the polymerizable composition comprises about 8% or less by weight of said one or more hydrophilic acrylic monomers, relative to the total amount of all polymerizable components in the polymerizable composition .

138. The method of embodiment 134 or 135, wherein the polymerizable composition comprises about 5% or less by weight of said one or more hydrophilic acrylic monomers, relative to the total amount of all polymerizable components in the polymerizable composition .

139. The method of any one of embodiments 72 to 136, wherein the polymerizable composition comprises about 60% or more by weight of components (a), (b) and (c) together, relative to the total amount of all polymerizable components in the polymerizable composition .

140. The method of any one of embodiments 72 to 138, wherein the polymerizable composition comprises about 65% or more by weight of components (a), (b) and (c) together, relative to the total amount of all polymerizable components in the polymerizable composition .

141. The method of any one of embodiments 72 to 138, wherein the polymerizable composition comprises about 70% or more by weight of components (a), (b) and (c) together, relative to the total amount of all polymerizable components in the polymerizable

composition .

142. The method of any one of embodiments 72 to 138, wherein the the silicone hydrogel contact lens comprises about 75% or more by weight of components (a), (b) and (c) together, relative to the total amount of all polymerizable components in the polymerizable composition .

143. The method of any one of embodiments 72 to 142, wherein the polymerizable composition is clear at a temperature of from about 0 to about 4°C.

The previous disclosure will enable one having ordinary skill in the art to practice the invention. Various modifications, variations, and combinations can be made to the various embodiment described herein. In order to better enable the reader to understand specific embodiments and the advantages thereof, reference to the following examples is suggested . It is intended that the specification and examples be considered as exemplary.

## Example 1

### Oxygen Permeability Measurements

Unless specified , the apparent oxygen permeability ($Dk_{app}$), the apparent oxygen transmissibility (Dk /t), the intrinsic (or edge-corrected) oxygen permeability (Dk or $Dk_c$) of a lens and a lens material are determined according to procedures described in Example 1 of U.S. Pat. Appl. Pub. No. 2012-0026457 A1.

### Surface wettability Tests

Water contact angle (WCA) on a contact lens is a general measure of the surface wettability of a contact lens. In particular, a low water contact angle corresponds to more wettable surface. The dynamic captive bubble contact angles of contact lenses are measured using a FDS instrument device from FDS Future Digital Scientific Corp. The FDS equipment is capable of measuring the advancing and receding contact angles. The measurement is performed on hydrated contact lenses at room temperature. A contact lens is removed from the vial and soaked in ~ 40 ml_ fresh phosphate buffered saline(PBS) and shake for at least 30 minutes, then replace with fresh PBS, soak and shake for another 30 minutes unless otherwise specified . The contact lens is then put on a lens paper and dabbed to remove surface water prior to be placed on top of a lens holder with front curve up then screw the lens holder top on. Place the secure lens holder into the glass cell cuvette filled with filtered PBS. Place the glass cell cuvette onto the stage of the FDS instrument. Adjust the stage height and the syringe needle to dispense the air bubble to the lens surface. Repeat dispense/withdrawl 3 cycles for every lens to get the advancing and receding contact angles. The receding contact angles are reported in the examples below.

### Water Break-up Time (WBUT) Tests

The surface hydrophilicity of lenses (after autoclave) is assessed by determining the time required for the water film to start breaking on the lens surface. Lenses exhibiting WBUT ≥ 10 seconds are considered to have a hydrophilic surface and are expected to exhibit adequate wettability (ability to support the tear film) on-eye.

Lenses are prepared for water breakup measurement by removing the lens from its blister with soft plastic tweezers (Menicon) and placing the lens in a beaker containing phosphate buffered saline. The beaker contains at least 20 mL phosphate buffered saline per lens, with up to 3 lenses per beaker. Lenses are soaked for a minimum 30 minutes up to 24 hours before being transferred with soft plastic tweezers into a 96 well plastic tray with fresh phosphate buffered saline.

Water breakup time is measured at room temperature as follows: lenses are picked up with soft plastic tweezers as close to the edge of the lens as possible, base curve toward the measurer, taking care that the lens does not touch the sides of the well after being removed from the saline. As illustrated schematically in Figure 1, the lens **(101)** is shaken once to remove excess saline and a timer is started. Ideally, the water film **(120)** in the base curve surface of the lens will recede from the point of contact with the tweezers's tips (111) in a uniform, circular pattern **(125).** When approximately 30% of the hydrated area **(125)** has receded, the timer is stopped and this time is recorded as the water breakup time (WBUT). Lenses that do not display the ideal receding pattern can be placed back in the tray and re-measured, after rehydrating for at least 30 seconds.

**Equilibrium Water Content**

The equilibrium water content (EWC) of contact lenses are determined as follows.

Amount of water (expressed as percent by weight) present in a hydrated hydrogel contact lens, which is fully equilibrated in saline solution, is determined at room temperature. Quickly stack the lenses, and transfer the lens stack to the aluminum pan on the analytical balance after blotting lens in a cloth. The number of lenses for each sample pan is typically five (5). Record the pan plus hydrated weight of the lenses. Cover the pan with aluminum foil. Place pans in a laboratory oven at 100±2 °C to dry for 16-18 hours. Remove pan plus lenses from the oven and cool in a desiccator for at least 30 minutes. Remove a single pan from the desiccator, and discard the aluminum foil. Weigh the pan plus dried lens sample on an analytical balance. Repeat for all pans. The wet and dry weight of the lens samples can be calculated by subtracting the weight of the empty weigh pan.

**Elastic Modulus**

The elastic modulus of a contact lens is determined using a MTS insight instrument. The contact lens is first cut into a 3.12mm wide strip using Precision Concept two stage cutter. Five thickness values are measured within 6.5mm gauge length. The strip is mounted on the instrument grips and submerged in PBS (phosphate buffered saline) with the temperature controlled at 21 ± 2 °C. Typically 5N Load cell is used for the test. Constant force and speed is applied to the sample until the sample breaks. Force and displacement data are collected by the TestWorks software. The elastic modulus value is calculated by the TestWorks software which is the slope or tangent of the stress vs. strain curve near zero elongation, in the elastic deformation region.

**Transmittance**

Contact lenses are manually placed into a specially fabricated sample holder or the like which can maintain the shape of the lens as it would be when placing onto eye. This holder is then submerged into a 1 cm path-length quartz cell containing phosphate buffered saline (PBS, pH ~ 7.0 - 7.4) as the reference. A UV/visible spectrpohotmeter, such as, Varian Cary 3E UV-Visible Spectrophotometer with a LabSphere DRA-CA-302 beam splitter or the like, can be used in this measurement. Percent transmission spectra are collected at a wavelength range of 250-800 nm with %T values collected at 0.5 nm intervals. This data is transposed onto an Excel spreadsheet and used to determine if the lenses conform to Class 1 UV absorbance. Transmittance is calculated using the following equations:

$$\text{UVA \%T} = \frac{\text{Average\%T between 380-316nm}}{\text{Luminescence \%T}} \times 100$$

$$\text{UVB \%T} = \frac{\text{Average\%T between 280-315nm}}{\text{Luminescence \%T}} \times 100$$

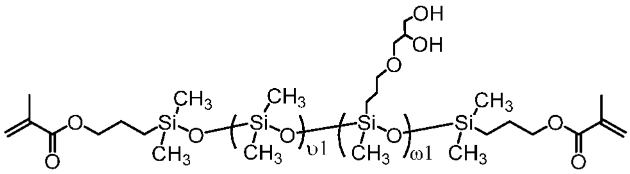
$$\text{Violet \%T} = \frac{\text{Average\%T between 440 - 380 nm}}{\text{Luminescence \%T}} \times 100$$

in which Luminescence %T is the average % transmission between 380 and 780.

**Chemicals**

The following abbreviations are used in the following examples: NVP represents N-vinylpyrrolidone; DMA represents N,N-dimethylacrylamide; VMA represents N-vinyl-N-methyl acetamide; MMA represents methyl methacrylate; TEGDMA represent triethyleneglycol dimethacrylate; TEGDVE represents triethyleneglycol divinyl ether; EGMA represents ethylene glycol methyl ether methacrylate; VAZO 64 represents 2,2'-dimethyl-2,2'azodipropiononitrile; Nobloc is 2-[3-(2H-Benzotriazol-2-yl)-4-hydroxyphenyl]ethyl methacrylate from Aldrich; UV28 represents 2-{2'-Hydroxy-3'-fe/?-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-chloro-2/-/-benzotriazole; RB246 is Reactive Blue 246; RB247 is Reactive Blue 247; TAA represents tert-amyl alcohol; PrOH represents 1-propanol; IPA represents isopropanol; DC 1173 represents Darocur 1173® photoinitiator; MeCN represents acetonitrile; SiGMA represents 3-(3-methacryloxy-2-hydroxypropyloxypropyl-bis(trimethylsiloxy)methylsilane; mSi1 represents monobutyl-terminated monomethacryloxypropyl-terminated polydimethylsiloxane (Mw ~ 600 to 800 g/mol from

Gelest); mSi2 represents monobutyl-terminated monomethacryloxypropyl-terminated polydimethylsiloxane (Mw ~ 1100 g/mol from Gelest); D3 represents monobutyl-terminated monomethacryloxypropyl-terminated polydimethylsiloxane (Mw ~ 539 g/mol from Shin-Etsu); D6 represents monobutyl-terminated monomethacryloxypropyl-terminated polydimethylsiloxane (Mw ~ 761 g/mol from Shin-Etsu); D9 represents monobutyl-terminated monomethacryloxypropyl-terminated polydimethylsiloxane (Mw ~ 984 g/mol from Shin-Etsu); D7 represents monobutyl-terminated monomethacryloxypropyl-terminated polydimethylsiloxane (Mw ~ 750 g/mol from Shin-Etsu); D8 represents monobutyl-terminated monomethacryloxypropyl-terminated polydimethylsiloxane (Mw ~ 850 g/mol from Shin-Etsu); LM-CEPDMS represents a di-methacrylate-terminated chain-extended polydimethylsiloxane (Mn ~ 6000 g/mol), which has three polydimethylsiloxane (PDMS) segments linked via diurethane linkages between two PDMS segments and two urethane linkages each located between one terminal methacrylate group and one PDMS segment, is prepared according to method similar to what described in Example 2 of U.S. Pat. No. 8529057; CEPDMS represents a di-methacrylate-terminated chain-extended polydimethylsiloxane (Mn ~ 9000 g/mol), which has three polydimethylsiloxane (PDMS) segments linked via diurethane linkages between two PDMS segments and two urethane linkages each located between one terminal methacrylate group and one PDMS segment, is prepared according to method similar to what described in Example 2 of U.S. Pat. No. 8529057; Betacon represents a dimethacrylate-terminated chain-extended polydimethylsiloxane (Mn ~ 5000 g/mol), which has two polydimethylsiloxane (PDMS) segments separated by one perfluoropolyether (PFPE) via diurethane linkages between PDMS and PFPE segments and two urethane linkages each located between one terminal methacrylate group and one PDMS segment, is prepared according to method similar to what described in Example B-1 of U.S. Pat. No. 5760100; "GA" macromer represents a di-methacryloyloxypropyl-terminated polysiloxane (Mn ~ 6.8K g/mol, OH content ~ 1.2 meq/g) of formula (A); "G0" macromer represents a di-methacryloyloxypropyl-terminated polysiloxane (Mn ~ 8.0K g/mol, OH content ~ 1.8 meq/g) of formula (A); "G1" macromer represents a di-methacryloyloxypropyl-terminated polysiloxane (Mn ~ 10.7K g/mol, OH content ~ 1.8 meq/g) of formula (A); "G3" macromer represents a di-methacryloyloxypropyl-terminated polysiloxane (Mn ~ 16.3K g/mol, OH content ~ 1.8 meq/g) of formula (A); "G4" macromer represents a di-methacryloyloxypropyl-terminated polysiloxane (Mn ~ 13.5K g/mol, OH content ~ 1.8 meq/g) of formula (A); "G5" macromer represents a di-methacryloyloxypropyl-terminated polysiloxane (Mn ~ 14.8K g/mol, OH content ~ 2.2 meq/g) of formula (A); "G6" macromer represents a di-methacryloyloxypropyl-terminated polysiloxane (Mn ~ 17.9K g/mol, OH content ~ 2.2 meq/g) of formula (A). A di-methacryloyloxypropyl-terminated polysiloxane of formula (A) is prepared according to the procedures described in U.S. Pat. App. Pub. No. 2017-0166673 A1.



(A)

## Example 2

A lens formulation is purged with nitrogen at room temperature for 30 to 35 minutes. The $N_2$-purged lens formulation is introduced into polypropylene molds and thermally cured in an oven under the following curing conditions: ramping from room temperature to a first temperature and then holding at the first temperature for a first curing time period; ramping from the first temperature to a second temperature and holding at the second temperature for a second curing time period; optionally ramping from the second temperature to a third temperature and holding at the third temperature for a third curing time period; and optionally ramping from the third temperature to a fourth temperature and holding at the fourth temperature for a fourth curing time period.

Lens molds are opened by using a demolding machine with a push pin. Lenses are pushed onto base curve molds with a push pin and then molds are separated into base curve mold halves and front curve mold halves. The base curve mold halves with a lens thereon are placed in an ultrasonic device (e.g., Dukane's single horn ultrasonic device). With a certain energe force, a dry state lens is relased from mold. The dry state lens is loaded in a designed extraction tray. Alternatively, lenses can be removed from the base curve mold halves by floating off (i.e., soaking in an organic solvent, e.g., IPA, without ultrasonic). The lenses removed from the molds are subjected to an extraction process using water or an organic solvent or a mixture of solvents for at least 30 minutes. For example, extracted in 50% IPA for 30 min, or in 100% IPA for 15 min then back to 50% IPA for 30 min, DI water for 30min and finally in PBS saline overnight. Inspected lens is packaged in lens packages containing a phosphate buffered saline (pH ~ 7.2) and autoclaved at 121°C for about 30-45 minutes.

## Example 3

A lens formulation is purged with nitrogen at room temperature for 30 to 35 minutes. The $N_2$-purged lens formulation is introduced into polypropylene molds and cured by UV/visible light (Hamamatsu lamp) for a curing time period. The post cast molding procedures described in Example 2 are used in this process for producing SiHy contact lenses.

## Examples 4-24

In Examples 4 to 24, polymerizable compositions are prepared and listed in Tables 1-

4. All the concentrations of the components listed in the tables are weight part units. The prepared polymerizable compositions comprises 0.01 weight part of a reactive dye (RB246 or RB247) and 0.5 weight part of free radical initiator (either VAZO 64 for thermally curable compositions or DC1 173 for UV-curable compositions).

Table 1

| | Ex.4 | Ex. 5 | Ex. 6 | Ex. 7 | Ex. 8 | Ex. 9 |
|---|---|---|---|---|---|---|
| **1st mPDMS** | 40 (mSi1) | 33 (mSi1) | 33 (mSi2) | 30 (mSi1) | 26 (mSi1) | 40 (mSi2) |
| **Si Macromer** | 5 (CE-PDMS) | 10 (CE-PDMS) | 10 (CE-PDMS) | 14 (CE-PDMS) | 17 (CE-PDMS) | 5 (CE-PDMS) |
| **NVP** | 43 | 40 | 40 | 44 | 43 | 43 |
| **MMA** | 10 | 15 | 15 | 10 | 15 | 10 |
| **TEGDMA** | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **Solvent** | 0 | 0 | 0 | 6 (TAA) | 0 | 0 |
| **Curing Profile** | 55/70/100 °C 4h/4h/1 h | 55/70/100 °C 4h/4h/1h | 55/70/100 °C 4h/4h/1h | 55/70/100 °C 4h/4h/1h | 55/70/100 °C 4h, 4h, 1 h | 55/70/100 °C 4h/4h/1h |
| **Extraction Medium** | IPA | IPA | IPA | IPA | IPA | IPA |

Table 2

| | Ex. 10 | Ex. 11 | Ex. 12 | Ex. 13* | Ex. 14 | Ex. 15 |
|---|---|---|---|---|---|---|
| **1st mPDMS** | 26 (mSi2) | 35 (mSi1) | 37 (mSi2) | 18 (mSi2) | 34 (D6) | 22 (D3) |
| **2nd mPDMS** | 0 | 0 | 0 | 16 (mSi1) | 0 | 0 |
| **Si Macromer** | 17 (CE-PDMS) | 5 (CE-PDMS) | 3 (betacon) | 5 (betacon) | 6 (GA) | 25 (G1) |
| **NVP** | 40 | 48 | 50 | 50 | 40 | 43 |
| **MMA** | 15 | 10 | 10 | 5 | 10 | 10 |
| **TEGDMA** | 0.2 | 0.2 | 0.5 | 1 | 0.2 | 0.2 |
| **HEMA** | 0 | 0 | 0 | 0 | 0.2 | 0 |
| **TEGDVE** | 0 | 0 | 0.1 | 0.1 | 0 | 0 |
| **Norbloc** | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 2 |
| **Solvent** | 10 (1-hexanol) | 10 (PrOH) | 0 | 0 | 3 (TAA) | 0 |
| **Curing Profile** | 55/70/100 °C 4hr/4hr/1hr | 55/70/100 °C 4hr/4hr/1hr | 55/80/100 °C (40min/)$_2$40min | 55/80/100 °C (40min/)$_2$40min | 55/80/100 °C; (30min/)$_2$30min | 55/80/100 °C 1hr/1hr/1hr |
| **Extraction medium** | IPA | IPA | IPA; & aqueous | IPA, & aqueous | H2O; & IPA | IPA |

* also contains 5 weight part units of methoxy ethyleneglycol methacrylate.

Table 3

| | Ex. 16 | Ex. 17 | Ex. 18 | Ex. 19 | Ex. 20 | Ex. 21 |
|---|---|---|---|---|---|---|
| **1st mPDMS** | 25 (D3) | 35 (D3) | 33 (mSi1) | 25 (mSi1) | 30 (D9) | 35 (D6) |
| **Si Macromer** | 25 (G1) | 10 (G1) | 4 (LMW-CEPDMS) | 25 (GA) | 16 (G3) | 12 (G1) |
| **NVP** | 40 | 48 | 53 | 40 | 45 | 46 |
| **MMA** | 10 | 7 | 10 | 10 | 7 | 7 |
| **TEGDMA** | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **Norbloc** | 2 | 2 | 2 | 2 | 2 | 2 |
| **Solvent** | 0 | 0 | 0 | 0 | 7 (TAA) | 3 (TAA) |
| **Curing Profile** | 55/80/100 °C 1hr/1hr/1hr | 55/80/100 °C 1hr/1hr/1hr | 55/80/100 °C 1hr/1hr/1hr | 55/80/100 °C 1hr/1hr/1hr | 55/80/100 °C 1hr/1hr/1hr | 55/80/100 °C 1hr/1hr/1hr |
| **Extraction medium** | IPA | IPA | $H_2O$ | IPA | IPA | IPA |

Table 4

| | Ex. 22 | Ex. 23 | Ex. 24 |
|---|---|---|---|
| **Ist mPDMS** | 18 (mSi2) | 18 (mSi2) | 36.5 (D3) |
| **2nd mPDMS** | 16 (mSi1) | 16 (mSi1) | 0 |
| **Si Macromer** | 5 (betacon) | 5 (LMW-CEPDMS) | 7.7 (CE-PDMS) |
| **NVP** | 50 | 50 | 43.8 |

| | | | |
|---|---|---|---|
| MMA | 5 | 5 | 10 |
| TEGDMA | 1 | 1 | 0 |
| DMA | 0.1 | 0.1 | 0 |
| Initiator | 0.5 (DC1 173) | 0.5 (DC1 173) | 0.5 **(VAZO** 64) |
| Curing Profile | 5mW/cm$^2$ 30 min | 5mW/cm$^2$ 30 min | 55/70/1 00 °C 4hr/4hr/1 hr |
| Extraction medium | **IPA;** & aqueous | **IPA;** & aqueous | **IPA** |

SiHy contact lenses are prepared from those polymerizable compositions according to curing processes described in Example 2 or 3. The lens properties of resultant SiHy contact lenses are determined according to procedure described in Example 1 and reported in Table 5.

Table 5

| | [NVA] mmol / [Si comp] g | [H-D] meq / [NVA] g | **Dk (Barrers)** | **EWC (%)** | **Modulus (MPa)** | **WBUT (s)** | **WCA$_{CB}$ (°)** |
|---|---|---|---|---|---|---|---|
| **Ex. 4** | 8.6 | 0.078 | NA | NA | NA | 2 | NA |
| **Ex. 5** | 8.4 | 0.17 | NA | NA | NA | 1 | NA |
| **Ex. 6** | 8.4 | 0.17 | NA | NA | NA | 1 | NA |
| **Ex. 7** | 9.0 | 0.21 | 106 | NA | 0.79 | 10 | NA |
| **Ex. 8** | 9.0 | 0.26 | NA | NA | NA | 5 | NA |
| **Ex. 9** | 8.6 | 0.078 | NA | NA | NA | 5 | NA |
| **Ex. 10** | 8.4 | 0.28 | NA | NA | NA | 5 | NA |
| **Ex. 11** | 10.8 | 0.07 | NA | NA | NA | <1 | NA |
| **Ex. 12** | 11.2 | 0.072 | NA | 50.8 | 1.11 | 3~5 | NA |
| **Ex. 13** | 11.5 | 0.10 | NA | NA | NA | 0~2 | NA |
| **Ex. 14** | 9.0 | 0.18 | 85 | 49 | 0.69 | 15 | NA |
| **Ex. 15** | 8.2 | 1.05 | 106 | 44 | NA | <5 | NA |
| **Ex. 16** | 7.2 | 1.13 | 120 | 41 | NA | <1 | NA |
| **Ex. 17** | 9.6 | 0.38 | 113 | 48 | 0.77 | 10 | 54 |
| **Ex. 18** | 12.9 | 0.075 | 88 | | 0.6 | 5 | 55 |
| **Ex. 19** | 7.2 | 0.75 | 117 | 40 | 1.2 | 8 | NA |
| **Ex. 20** | 8.8 | 0.64 | 126 | 54 | 0.66 | 30 | 44 |
| **Ex. 21** | 8.8 | 0.47 | 112 | 52 | 0.65 | 14 | 45 |
| **Ex. 22** | 11.5 | 0.12 | NA | NA | 0.44 | 15 | 25~40 |
| **Ex. 23** | 11.5 | 0.10 | NA | NA | NA | 15 | 40 |
| **Ex. 24** | 8.9 | 0.12 | 85 | 50 | 0.56 | 11 | 64 |

NVA: N-vinyl amide monomer(s); H-D: H-donor moieties; Si-comp: all silicone-containing polymerizable component.

As shown in Table 5, there are two limitations on the amounts of the siloxane-containing vinylic monomer, the linear polysiloxane vinylic crosslinker and the N-vinyl amide monomer in a polymerizable composition for forming inherently wettable SiHy contact lenses.

The first limitation appears to be that there is a threshold amount of the N-vinyl amide monomer relative to the total amount of all silicone-containing polymerizable components. That threshold value of the amount of the N-vinyl amide monomer is likely around 8.8 mmoles per gram of all the silicone-containing polymerizable components. In order to form inherently wettable SiHy contact lenses, a polymerizable composition should comprise at least about 8.8 mmoles per gram of all silicone-containing polymerizable components present in the polymerizable composition .

The second limitation appears to be that there is also a threshold value for the total amount of the H-donor moieties ("H-D") contributed by the polysiloxane vinylic crosslinker and the siloxane-containing vinylic monomer relative to the amount of the N-vinyl amide monomer. That threshold value appears to be around 0.1 1 meqs of H-donor moieties per gram of the N-vinyl amide monomer. In order to form inherently wettable SiHy contact lenses, a polymerizable composition should comprise about 0.11 meqs or higher of H-donor moieties (contributed from all the silicone-containing polymerizable components) per gram of the N-vinyl amide monomer.

### Examples 25-38

In Examples 25 to 38, polymerizable compositions are prepared and listed in Tables 6-8. All the concentrations of the components listed in the tables are weight part units. The prepared polymerizable compositions comprises 0.01 weight part of a reactive dye (RB246 or RB247) and 0.5 weight part of free radical initiator (either VAZO 64 for thermally curable compositions or DC1 173 for UV-curable compositions).

Table 6

| | Ex. 25 | Ex. 26 | Ex. 27 | Ex. 28 | Ex. 29* |
|---|---|---|---|---|---|
| 1st mPDMS | 25 (M11) | 28 (M11) | 28 (M11) | 25 (M11) | 30 (M07) |
| Si Macromer | 15 (betacon) | 7 (betacon) | 7 (betacon) | 15 (LMW-CEPDMS | 10 (LMW-CEPDMS) |
| NVP | 50 | 58 | 58 | 50 | 40 |
| MMA | 10 | 10 | 10 | 10 | 10 |
| TEGDMA | 0.5 | 0.2 | 0.5 | 0.25 | 0.2 |
| DMA | 2 | 2 | 0 | 2 | 0 |
| TEGDVE | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| Curing Profile | 5mW/cm$^2$ 60 min | 5mW/cm$^2$ 60 min | 5mW/cm$^2$ 60 min | 5mW/cm$^2$ 60 min | 55/80/100 °C 60 min each |
| Extraction medium | IPA; & aqueous | IPA; & aqueous | IPA | IPA | IPA and aqueous |

*. the formulation further includes 5 weight parts of EGMA ;

Table 7

| | Ex. 30 | Ex. 31 | Ex. 32 | Ex. 33 | Ex. 34 |
|---|---|---|---|---|---|
| 1st mPDMS | 26 (M07) | 28 (M07) | 24.5 (M07) | 26 (M07) | 28 (M07) |
| Si Macromer | 7.5 (LMW-CEPDMS) | 12 (LMW-CEPDMS) | 10.5 (LMW-CEPDMS) | 11 (CE-PDMS) | 12 (LMW-CEPDMS) |
| NVP | 55 | 50 | 53 | 48 | 50 |
| MMA | 10 | 10 | 10 | 10 | 10 |
| TEGDMA | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| TEGDVE | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Curing Profile | 55/80/100 °C 60 min each | 55/80/100 °C 60 min each | 55/80/100 °C 60 min each | 55/80/100 °C 60 min each | 55/80/100 °C 60 min each |
| Extraction medium | IPA and aqueous | IPA and aqueous | IPA and aqueous | IPA | Aqueous; coated |

Table 8

| | Ex. 35 | Ex. 36 | Ex. 37 | Ex. 38 |
|---|---|---|---|---|

| 1st mPDMS | 32 (D9) | 32 (M07) | 32 (M07) | 30 (D9) |
|---|---|---|---|---|
| Si Macromer | 10(CE-PDMS) | 10 (CE-PDMS) | 10 (CE-PDMS) | 14 (CE-PDMS) |
| NVP | 49 | 49 | 49 | 44 |
| MMA | 7 | 7 | 7 | 10 |
| TEGDMA | 0 | 0.2 | 0.2 | 0.2 |
| DMA | 0 | 0 | 2 | 0 |
| TEGDVE | 0 | 0 | 2 | 0 |
| Solvent | 0 | 10 (PrOH) | 10 (PrOH) | 10 (TAA) |
| Curing Profile | 55/70/1 00 °C 1hr/1 hr/1 hr | 55/80/1 00 °C 1hr/1 hr/1 hr | 55/80/1 00 °C 1hr/1hr/1hr | 55/70/1 00 °C 4hr/4hr/1hr |
| Extraction medium | IPA | IPA | IPA | IPA |

SiHy contact lenses are prepared from those polymerizable compositions according to curing processes described in Example 2 or 3. The lens properties of resultant SiHy contact lenses are determined according to procedure described in Example 1 and reported in Table 9.

Table 9

| | $\frac{[NVA]\ mmol}{[Si\ comp]\ g}$ | [H-D] (meq/g NVA) | Dk (barrers) | EWC (%) | Modulus (MPa) | WBUT (s) | $WCA_{CB}$ (°) |
|---|---|---|---|---|---|---|---|
| Ex. 25 | 11.2 | 0.36 | 77 | NA | 0.88 | 15 | NA |
| Ex. 26 | 14.9 | 0.14 | 77 | NA | 0.88 | NA | 40~50 |
| Ex. 27 | 14.9 | 0.14 | NA | NA | NA | 15 | 40 |
| Ex. 28 | 11.2 | 0.3 | NA | NA | 0.83 | 15 | 30~35 |
| Ex. 29 | 9.0 | 0.25 | 87 | 43.62 | 0.99 | NA | NA |
| Ex. 30 | 14.8 | 0.14 | 71 | NA | 0.57 | 18 | NA |
| Ex. 31 | 11.2 | 0.24 | 82 | NA | 0.69 | 18 | 53.8 |
| Ex. 32 | 13.6 | 0.2 | 76 | NA | 0.67 | 18 | NA |
| Ex. 33 | 11.7 | 0.15 | 75 | 55.9 | 0.68 | NA | NA |
| Ex. 34 | 11.2 | 0.24 | 89 | NA | 0.76 | 15 | NA |
| Ex. 35 | 10.5 | 0.14 | 121 | 56 | 0.71 | 30 | 45 |
| Ex. 36 | 10.5 | 0.14 | 121 | 53 | 0.76 | 32 | 52 |
| Ex. 37 | 10.5 | 0.14 | 111 | NA | 0.6 | 42 | 50 |
| Ex. 38 | 9.0 | 0.21 | 124 | NA | 0.66 | 14 | NA |

Table 9 shows that when a polymerizable composition comprises at least 8.8 mmoles of N-vinyl amide monomer(s) (NVP and/or VMA) per gram of the sum of the siloxane-containing vinylic monomer and the polysiloxane vinylic crosslinker and greater than 0.1 1 meqs of the H-donor moieties (i.e., hydroxyl groups of the polysiloxane vinylic crosslinker) per gram of N-vinyl amide monomer(s) (NVP and/or VMA), the resultant SiHy lenses prepared from such a composition are inherently wettable.

All the publications, patents, and patent application publications, which have been cited herein above in this application, are hereby incorporated by reference in their entireties.

What is claimed is:

1. A silicone hydrogel contact lens, comprising a silicone hydrogel bulk material which comprises:
   (1) first repeating units of at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties,
   (2) second repeating units of at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having one or more second H-donor moieties,
   (3) third repeating units of at least one hydrophilic N-vinyl amide monomer, and
   (4) optionally fourth repeating units of at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties,

   wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker, wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of -NHR°, amino linkages of -NH- , amide linkages of -CONH- , urethane linkages of -OCONH-, urea linkages of -HNCONH-, or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl,

   wherein the silicone hydrogel bulk material comprises at least 8.8 (preferably at least 9.0, more preferably at least 9.2, even more preferably at least 9.6) mmoles of the third repeating units per gram of all the first, second and fourth repeating units in total and at least 0.1 1 (preferably at least 0.1 5, more preferably at least 0.20, even more preferably at least 0.25) meqs of all the first, second and third H-donor moieties in total per gram of the third repeating units,

   wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers (preferably at least 60 barrers, more preferably at least 70 barrers, even more preferably at least 80 barrers, most preferably at least 100 barrers), an elastic modulus of from about 0.2 MPa to about 1.5 MPa (preferably from about 0.3 MPa to about 1.2 MPa, more preferably from about 0.4 MPa to about 1.0 MPa), and an equilibrium water content of from about 40% to about 70% (preferably from about 43% to about 65%, more preferably from about 45% to about 60%) by weight and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds (preferably at least 15 seconds, more preferably at least 20 seconds) and a water contact angle by captive bubble of about 80 degrees or less (preferably about 75 degrees or less, more preferably about 70 degrees or less, even more preferably about 65 degrees or less, most preferably about 60 degrees or less) without being subjected to any post-curing surface treatment.

2. The silicone hydrogel contact lens of claim 1, wherein the linear chain-extended polysiloxane vinylic crosslinker comprises two terminal (meth)acryloyl groups and from 2 to 20 polysiloxane segments each pair of which are linked via an organic radical having at least two H-donor moieties selected from group consisting of urethane linkage of -OCONH-, hydroxyl groups, carboxyl groups, amino groups of **-NHR $^{0}$,** amino linkages of -NH- , amide linkages of -CONH- , and combinations thereof, wherein the polysiloxane vinylic crosslinker.

3. The silicone hydrogel contact lens of claim 1 or 2, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (1)

$$E_1\left[\begin{matrix}CH_3\\|\\-Si-O-\\|\\CH_3\end{matrix}\left(\begin{matrix}CH_3\\|\\Si-O\\|\\CH_3\end{matrix}\right)_{\upsilon 1}-L_3\right]_{\omega 1}\left(\begin{matrix}CH_3\\|\\Si-O\\|\\CH_3\end{matrix}\right)_{\upsilon 1}\begin{matrix}CH_3\\|\\-Si-E_1\\|\\CH_3\end{matrix} \qquad (1)$$

in which:

$\upsilon 1$ is an integer of from 5 to 50 and $\omega 1$ is an integer of from 1 to 15; $L_3$ is a divalent radical of $-L_3'$-O-(C 2H4O)-$_{q}$^-CONH-R $_2${NHCO-PE-CONH-R 2)--$_{gi}$ NHCO-{OC 2H4)$_{q2}$0 - $L_3'$- ;

**PE** is a divalent radical of

$-(CH_2CH_2O)_{q3}$-Zo-CF $_2$$-(OCF_2)_x-(OCF_2CF_2)_y$-$OCF_2$- $Z_0$-(oCH $_2$C$H_2)_{q}$3 or

- $Z_0$4cH $_2$C$H_2$o $)_{q4}$$\left(CH_2\text{-}\overset{CH_3}{\overset{|}{C}}H\text{-}O\right)_{q5}$$\left(CH_2\ \overset{C_2H_5}{C'H}\text{-}O\right)$ J-T-ZQ- **; $E_1$** is a monovalent radical of

$H_2C=\overset{R0}{c}-\overset{O}{\overset{\|}{C}}-X$ $_{01}$- $L_4$— ; $L_4$ is a divalent radical of $-C_2H_4$-NHCO -o-¾c $_2H_4$o ¾2 $L_3'$— ,

$-(C_2H_40)_{q1}$-CONH-R2-NHCO-0-(c2H40)^2**-L3'-**

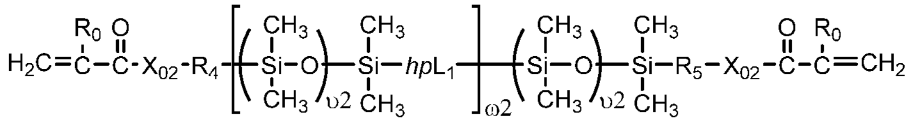
,

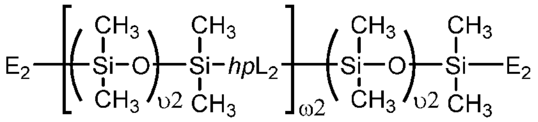
- $R_3$-0-CONH-R $_2$-NHCO-0-(c $_2H_4$0)^2-$L_3'$- , -CH $_2$-CH(OH)-CH$_2$-0-(c $_2H_4$o$)_{q2}$-$L_3'$- , or

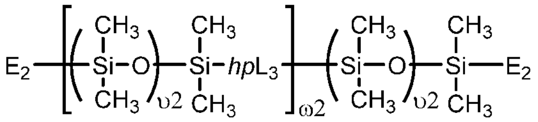
$-(C_2H_4O)_{q2}-L_3'-$ ; **Ro** is H or methyl; **Xo$_1$** is O or **NRni ; R$_{n1}$** is H or a C1-C10 alkyl; **$R_2$** is a **C4-C14** hydrocarbon divalent radical; **$R_3$** is a $C_2$-$C_6$ alkylene divalent radical; $L_3'$ is $C_3$-$C_8$ alkylene divalent radical; $Z_0$ is a direct bond or a $C_1$-$C_{12}$ alkylene divalent radical; g1 is 1 or zero; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; q3 is an integer of 0 to 2; q4 is an integer of 2 to 50, q5 and q6 independent of each other are a number of 0 to 35; provided that (q4+q5+q6) is an integer of 2 to 50; x+y is an integer of from 10 to 30.

4. The silicone hydrogel contact lens of claim 1 or 2, wherein the linear chain-extended

polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (2), (3) or (4)


(2)


(3)


(4)

in which:

$hpL_1$ is a divalent radical of

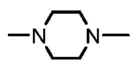
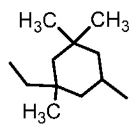
-R4-CH-CH(R0) 2-S-C 2H4-CH(H3C-C(O)-NH)-C(O)-NR n2-Y1-NR n2-C(O)-CH(HN-C(O)-CH3)-C 2H4-S-CH 2-CH(R0) $-R_5-$;

$hpL_2$ is a divalent radical of

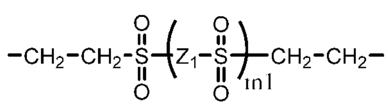
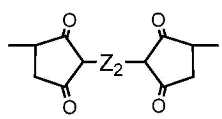
$-R_4$-NR n2-C(O)-CH(HN-C(O)—CH3)— C2H4-S-Y 2-S-C 2H4-CH(H3C—C(O)-NH)-C(O)-NR n2 $-R_5-$;

$hpL_3$ is a divalent radical of

- $R_4$-NR n2-C(O)-CH(HN-C(O)—CH3)— C2H4-S-Y 3-S-C 2H4-CH(H3C—C(O)—NH)-C(O)-NR n2- $R_5$- ;

Yi is a Ci-C 6 alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, a divalent radical of , or a divalent radical of ;

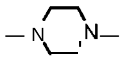
$Y_2$ is a divalent radical of — CH2-CH(R0)-C(O)-Z1-C(O)-CH(R0)-CH2— ;

$Y_3$ is a divalent radical of  or ;

$Z_1$ is a Ci-C 6 alkylene divalent radical, a hydroxyl-or methoxy-substituted Ci-C 6 alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical,

$Z_2$ is a Ci-C 6 alkylene divalent radical, a hydroxyl-or methoxy-substituted Ci-C 6 alkylene divalent radical, a dihydroxyl- or dimethoxy-substituted $C_2$-$C_6$ alkylene divalent radical, a divalent radical 0f -C2H 4-(O-C2H 4)m2-, a divalent radical of - $Z_4$-

S-S-Z4-, a hydroxyl- or methoxy-substituted Ci-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical,

$Z_3$ is a divalent radical of any one of (a) -NR $_{n_3}$- , (b)  , (c) -NR0-Z5-NR0-, and (d) -0-Z $_6$-0- ,

$Z_4$ is a $C_1$-$C_6$ alkylene divalent radical,

$Z_5$ is a $C_1$-C6 alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phospfionyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical,

$Z_6$ is (a) a $C_1$-$C_6$ alkylene divalent radical, (b) a divalent radical of

$$-\left(CH_2-\underset{}{\overset{OH}{C}H}-CH_2-O\right)_{m3}CH_2-\overset{OH}{C}H-CH_2-$$ ,

$$-CH_2-\overset{OH}{C}H-CH_2\text{-0-CH2-CH2-0-}CH_2-\overset{OH}{C}H-CH_2-,\quad -\left(CH_{2\text{-}}CH_{2}\text{-07^-}CH_2\text{-}CH_2\right)-$$

$$-\left(CH_2\right)_{M5}\text{0-}\overset{O}{\underset{OH}{P}}\text{-0}-(CH_2)_{m^5}-$$ , or (c) a substituted $C_3$-$C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group,

$Z_7$ is a divalent radical of $-\text{¾-}\overset{O}{C}-\overset{R_0}{C}H-CH_2-S-C_2H_4-\underset{}{\overset{H_3C-\overset{O}{C}-NH}{CH}}-\overset{O}{C}-NR_{n_2}-R_4-$ ;

$Z_8$ is a divalent radical of $-Z_9-\overset{O}{C}-\overset{R_0}{C}H-CH_2-S-C_2H_4-\overset{H_3C-\overset{O}{C}-NH}{CH}-\overset{O}{C}-NR_{n2}-R_4-$

$E_2$ is a monovalent radical of $H_2C=\overset{R_0}{C}-\overset{O}{C}-z_7-$ ;

υ2 is an integer of from 5 to 50;

ffi2 is an integer of from 1 to 15;

$X_{02}$ is O or $NR_{n2}$;

$R_0$ is hydrogen or methyl;

$R_{n2}$ is hydrogen or Ci-$C_4$-alkyl;

$R_{n_3}$ is hydrogen or Ci-$C_3$ alkyl;

$R_4$ and $R_5$ independent of each other are a Ci-$C_6$ alkylene divalent radical or a $C_1$-$C_6$ alkylene-oxy-Ci-$C_6$ alkylene divalent radical;

ml is 0 or 1, m2 is an integer of 1 to 6, m3 is 1 or 2, m4 is an integer of 1 to 5, m5 is 2 or 3.

5. The silicone hydrogel contact lens of claim 1 or 2, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (5)

$$E_3\!-\!\left[R_6\!\left(\begin{matrix}CH_3\\ |\\ Si\!-\!O\\ |\\ CH_3\end{matrix}\right)_{\upsilon 3}\!\!\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}\!-\!R_2\!-\!hpL_4\!-\!pOAlk\!-\!hpL_4\right]_{\omega 3}\!\!-R_6\!\left(\begin{matrix}CH_3\\ |\\ Si\!-\!O\\ |\\ CH_3\end{matrix}\right)_{\upsilon 3}\!\!\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}\!-\!R_7\!-\!E_3 \qquad (5)$$

in which:

$\upsilon 3$ is an integer of from 5 to 50;

$\omega 3$ is an integer of from 1 to 15;

E3 is a monovalent radical of $H_2C{=}\overset{R_0}{C}\!-\!\overset{O}{\overset{\|}{C}}\!-\!X_{03}\!-$ jn w hich $R_0$ is hydrogen or methyl, $X_{03}$ is O or $NR_{n4}$, and $R_{n4}$ is hydrogen or **CrC** $_4$-alkyl;

$R_6$ and $R_7$ independent of each other are a **Ci-C$_6$** alkylene divalent radical or a $C_1$-**C$_6$ alkoxy-Ci-C$_6$** alkylene divalent radical;

pOAlk is a divalent radical of $-(EO)_{e1}(PO)_{p1}(BO)_{b1}-$ in which EO is an oxyethylene unit ($-CH_2CH_2O-$), PO is an oxypropylene unit ( $-CH_2\!-\!\underset{CH_3}{\underset{|}{CH}}\!-\!O-$ ), and BO is an oxybutylene unit ( $-CH_2\!-\!\underset{C_2H_5}{\underset{|}{CH}}\!-\!O-$ ), e1 is an integer of 5 to 100, p1 and b1 independent of each other are an integer of 0 to 50, provided that $(e1+p1+b1)\geq 10$ and $\frac{e1}{(p1+b1)}\geq 2$ (preferably from about 2:1 to about 10:1, more preferably from about 3:1 to about 6:1) when $(p1+b1)\geq 1$;

$hpL_4$ is a divalent radical of $-X_{03}\!-\!\overset{O}{\overset{\|}{C}}\!-\!\overset{R_0}{\overset{|}{CH}}\!-\!CH_2\!-\!S\!-\!C_2H_4\!-\!\overset{H_3C-\overset{O}{\overset{\|}{C}}-NH}{\overset{|}{CH}}\!-\!\overset{O}{\overset{\|}{C}}\!-\!NR_{n4}\!-\!R_8\!-$ or $-R_9\!-\!NR_{n4}\!-\!\overset{O}{\overset{\|}{C}}\!-\!\overset{HN-\overset{O}{\overset{\|}{C}}-CH_3}{\overset{|}{CH}}\!-\!C_2H_4\!-\!S\!-\!CH_2\!-\!\overset{R_0}{\overset{|}{CH}}\!-\!\overset{O}{\overset{\|}{C}}\!-\!X_{03}\!-$ in which $R_8$ and $R_9$ independent of each other are a substituted or unsubstituted $C_1$-$C_{12}$ alkylene divalent radical.

6. The silicone hydrogel contact lens of claim 1 or 2, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (6)

$$E_4\!-\!\left[\left(\begin{matrix}CH_3\\ |\\ Si\!-\!O\\ |\\ CH_3\end{matrix}\right)_{\upsilon 4}\!\!\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}\!-\!G_1\!-\!CH_2\!-\!\overset{R_0}{\overset{|}{CH}}\!-\!S\!-\!J_0\!-\!S\!-\!\overset{R_0}{\overset{|}{CH}}\!-\!CH_2\!-\!G_1\right]_{\omega 4}\!\!-\!\left(\begin{matrix}CH_3\\ |\\ Si\!-\!O\\ |\\ CH_3\end{matrix}\right)_{\upsilon 4}\!\!\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}\!-\!E_4 \qquad (6)$$

in which

**v4** is an integer from 5 to 100;

$\omega 4$ is an integer of 1 to 15;

$R_0$ is hydrogen or methyl;

$J_0$ is a $C_1$- $C_{12}$ hydrocarbon radical having 0 to 2 hydroxyl or carboxyl groups;

G 1 is a direct bond, a C1-C4 alkylene divalent radical, or a bivalent radical of

— $X_{04}$-(C2H4O}i7i-CONH-M $_1$-NHCO-O-(c2H4O^2 ·$M_0$- ,

- $X_{05}$- $M_2$-O-CONH-M $_1$-NHCO-O-(c2H4O)j^-M $_0$- ,

- $X_{06}$- $CH_2$-CH(OH)-$CH_2$- O-($C_2H_4O$)$_{h2}$ $M_0$— , —$X_07$-($C_2H_4O$)$_{h2}$ $M_0$- ;

—$X_{08}$—$M_3$—NHCOO—($C_2H_4O$)$_{h1}$—$M_0$— , —$X_{10}$—$CH_2$—CH(OH)—$CH_2$—$X_{09}$—($C_2H_4O$)$_{h2}$—$M_0$— ,

- $X_{07}$- $M_3$- $X_{09}$-CH $_2$-CH(OH)-CH $_2$-O-$M_0$- , Or

- $X_{08}$-($C_2H_4O$)$_{h1}$ CH2-CH(OH)-CH2-O-M $_0$- in which hi is an integer of 1 to 20; h2 is an integer of 0 to 20; M 0 is C 3-C 8 alkylene divalent radical; M 1 is a C 4-C 14 hydrocarbon divalent radical; $M_2$ and $M_3$ independent of each other are a Ci-C 6 alkylene divalent radical; X o4 is -COO- or -CONRns-; Rns is H or a C1-C10 alkyl; X o5 and Xo7 independent of each other are a direct bond, -COO- or -CONRns-; Xo6 is a direct bond, a Ci-C 6 alkylene divalent radical, a Ci-C 6 alkylenoxy divalent radical, -COO-, or -CONRns-; X o8 is a direct bond or -COO-; X o9 is O or N R n5; X10 is a direct bond, a Ci-C 6 alkylene divalent radical, -COO-, or -CONRns-; Provided that M o is linked to Si atom while X 04 to X 10 are linked to the group of -CH 2- in formula (6) and that at least one of J 1 and G 1 comprises at least one moieties selected from the group consisting of hydroxyl groups, urethane linkage of -OCONH- , amino groups of -NHR o, amino linkages of -NH-, amide linkages of -CONH- , carboxyl groups, and combinations thereof;

$E_4$ is a monovalent radical of $H_2C=\overset{R_0}{C}-\overset{O}{\overset{\|}{C}}-X_{11}-G_2-$ or $H_2C=\overset{R_0}{C}-\overset{O}{\overset{\|}{C}}-G_3-$;

$X_{11}$ is O or $NR_{n5}$;

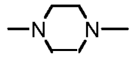
$G_2$ is a C1-C4 alkylene divalent radical or a bivalent radical of

-($C_2H_4$o)ji-CONH-M $_1$-NHCO-O-(c $_2$H4O)^2·$M_0$- ,

- $M_2$-O-CONH-M $_1$-NHCO -O-(c2H $_4$o)jj2 ·Mo- , -CH $_2$-CH(OH)-CH $_2$-O^C $_2H_4O$)$_{h2}$-$M_0$- ,

- ($C_2H_4O$)$_{h2}$ $M_0$- ; — M3-NHCOO-($C_2H_4O$)$_{h1}$ $M_0$- , -CH $_2$-CH(OH)-$CH_2$-$X_{09}$-($C_2$H4O^M $_0$- ,

—$M_3$- $X_{09}$-CH2-CH(OH)-CH $_2$-O-M $_0$- , Qr - ($C_2H_4$o)j7i-CH2-CH(OH)-CH2-O-$M_0$- ;

$G_3$ is a divalent radical of $-G_4\left(\overset{O}{\overset{\|}{C}}\right)_{h3}\overset{R_0}{CH}-CH_2-S-J_0-S-CH_2-\overset{R_0}{CH}\left(\overset{O}{\overset{\|}{C}}\right)_{h4}G_2-$ in which h3 and h4 independent of each other are 1 or 0, G4 is a divalent radical of any one of (a) $-NR_3-$ in which $R_3$ is hydrogen or C1-C3 alkyl, (b) , (c) $-NR''-G_5-NR''-$ in which R" is hydrogen or methyl and $G_5$ is a Ci-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical, and (d) $-0-G_6-0-$ in which $G_6$ is a Ci-$C_6$ alkylene divalent radical, a divalent radical of $-\left(CH_2-\underset{}{\overset{OH}{CH}}-CH_2-O\right)_{h4}-CH_2-\overset{OH}{CH}-CH_2-$ in which h4 is 1 or 2, a divalent radical of $-CH_2-\overset{OH}{C'H}-CH_2-O-CH_2-CH_2-O-CH_2-\overset{OH}{C'H}-CH_2-$, a divalent radical of $-\left(CH_2-CH_2-O\right)_{h5}-CH_2-CH_2-$ in which h5 is an integer of 1 to 5, a divalent radical of $-\left(CH_2\right)_{h6}-O-\underset{OH}{\overset{O}{P}}-O-\left(CH_2\right)_{m5}-$ in which h6 is 2 or 3, or a substituted C3-C8 alkylene divalent radical having a hydroxyl group or phosphonyloxy group.

7. The silicone hydrogel contact lens of any one of claims 1 to 6, the siloxane-containing vinylic monomer is a mono-(meth)acryloyl-terminated , monoalkyl-terminated polysiloxane of formula (I)

$$H_2C=\overset{R_o}{C}-\overset{O}{\overset{\|}{C}}-X_0-L_1-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{n1}-\underset{CH_3}{\overset{CH_3}{Si}}-R_{t1} \quad (I)$$

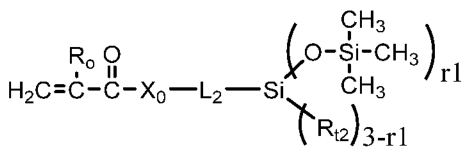
in which: $R_0$ is H or methyl; $X_0$ is O or NRi ; $L_1$ is a C3-C8 alkylene divalent radical or a divalent radical of $-L_1'-X_1-L_1''-$, $-\left(C_2H_4O\right)_{q1}-L_1''-$, $-\left(C_2H_4O\right)_{q1}-CONH-L_1''-$, $-L_1'-NHCOO-\left(C_2H_4O\right)_{q1}-L_1''-$, $-CH_2-CH(OH)-CH_2-X_1'-\left(C_2H_4O\right)_{q2}-L_1''-$, $-L_1'-Xi'-CH2-CH(OH)-CH_2-0-L_1''-$, or $-(C2H40)^-CH2-CH(OH)-CH2-0-L_1''-$ ; $L_1'$ is a Cz-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_1''$ is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, NRi , NHCOO, OCONH, CONR1 , or NR1CO; $R_1$ is H or a C1-C4 alkyl having 0 to 2 hydroxyl group; $R_{t1}$ is a C1-C4 alkyl; qi is an integer of 1 to 20, n1 is an integer of 3 to 25 (preferably 3 to 20, more preferably 3 to 15, even more preferably 3 to 10).

8. The silicone hydrogel contact lens of claim 7, wherein the mono-(meth)acryloyl-terminated , monoalkyl-terminated polysiloxane is mono-3-(meth)acryloxypropyl terminated mono-butyl terminated polydimethylsiloxane, mono-3-(meth)acryloxypropyl terminated mono-methyl terminated polydimethylsiloxane, mono-3-(meth)acryloxy-2-

hydroxypropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, mono-3-(meth)acryloxy-2-hydroxypropyloxypropyl terminated, mono-methyl terminated polydimethylsiloxane, a-(2-hydroxyl-methacryloxypropyloxypropyl)-u>butyl-decamethylpentasiloxane, N-methyl-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, N-(2,3-dihydroxypropane)-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, (meth)acryloylamidopropyltetra(dimethylsiloxy)dimethylbutylsilane, mono-(meth)acryloylamidopropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, mono-N-methyl-(meth)acryloylamidopropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, mono-3-(meth)acryloylamido-2-hydroxypropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, mono-3-[N-methyl-(meth)acryloylamido]-2-hydroxypropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, or a mixture thereof.

9. The silicone hydrogel contact lens of any one of claims 1 to 6, wherein the siloxane containing vinylic monomers is a vinylic monomer containing a tris(trimethylsilyloxy)silyl or bis(trimethylsilyloxy)alkylsilyl group.

10. The silicone hydrogel contact lens of claim 9, wherein the siloxane-containing vinylic monomer is a tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer of formula (II)



(II)

in which: $R_0$ is H or methyl; $X_0$ is O or NRi ; L_2 is a C3-C8 alkylene divalent radical or a divalent radical of or -L2 '-X2-L2"-, -(C $_2H_4$0 $)_q$i-L2"-, -(C2H $_4$0 $)_q$i-CONH-L2"-; or - $L_2$'-NHCOO-(C2H $_4$0)qi-L2"-, $L_2$' is a $C_2$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_2$" is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, CONR1, or NR1CO; $R_1$ is H or a C1-C4 alkyl having 0 to 2 hydroxyl group; $R_t$2 is a C1-C4 alkyl; q1 is an integer of 1 to 20, r1 is an integer of 2 or 3.

11. The silicone hydrogel contact lens of claim 9 or 10, wherein the tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer is selected from the group consisting of tris(trimethylsilyloxy)silylpropyl (meth)acrylate, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)methylsilane, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)butylsilane, 3-(meth)acryloxy-2-(2-hydroxyethoxy)-propyloxy)propylbis(trimethylsiloxy)methylsilane, N-

[tris(trimethylsiloxy)silylpropyl]-(meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl)-2-methyl (meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl) (meth)acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl)-2-methyl acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl) (meth)acrylamide, and mixtures thereof).

12. The silicone hydrogel contact lens of any one of claims 1 to 11, wherein the hydrophilic N-vinyl amide monomer is N-vinylpyrrolidone, N-vinyl piperidone, N-vinyl caprolactam, N-vinyl-N-methyl acetamide, N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, N-vinyl-N-ethyl acetamide, N-vinyl-N-ethyl formamide, and mixtures thereof (preferably is N-vinylpyrrolidone, N-vinyl-N-methyl acetamide, or combinations thereof.

13. The silicone hydrogel contact lens of any one of claims 1 to 12, wherein the silicone hydrogel contact lens further comprises repeating units of one or more non-silicone vinylic crosslinking agents (preferably selected from the group consisting of ethyleneglycol di-(meth)acrylate, diethyleneglycol di-(meth)acrylate, triethyleneglycol di-(meth)acrylate, tetraethyleneglycol di-(meth)acrylate, glycerol di-(meth)acrylate, 1,3-propanediol di-(meth)acrylate, 1,3-butanediol di-(meth)acrylate, 1,4-butanediol di-(meth)acrylate, glycerol 1,3-diglycerolate di-(meth)acrylate, ethylenebis[oxy(2-hydroxypropane-1 ,3-diyl)] di-(meth)acrylate, bis[2-(meth)acryloxyethyl] phosphate, trimethylolpropane di-(meth)acrylate, and 3,4-bis[(meth)acryloyl]tetrahydrofuan, diacrylamide, dimethacrylamide, N,N-di(meth)acryloyl-N-methylamine, N,N-di(meth)acryloyl-N-ethylamine, N,N'-methylene bis(meth)acrylamide, N,N'-ethylene bis(meth)acrylamide, N,N'-dihydroxyethylene bis(meth)acrylamide, N,N'-propylene bis(meth)acrylamide, N,N'-2-hydroxypropylene bis(meth)acrylamide, N,N'-2,3-dihydroxybutylene bis(meth)acrylamide, 1,3-bis(meth)acrylamidepropane-2-yl dihydrogen phosphate, piperazine diacrylamide, divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, triallyl cyanurate, trimethylopropane trimethacrylate, pentaerythritol tetramethacrylate, bisphenol A dimeth aery late, and combinations thereof, more preferably selected from the group consisting of tetra(ethyleneglycol) di-(meth)acrylate, tri(ethyleneglycol) di-(meth)acrylate, ethyleneglycol di-(meth)acrylate, di(ethyleneglycol) di-(meth)acrylate, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, or triallyl cyanurate).

14. The silicone hydrogel contact lens of any one of claims 1 to 13, wherein the silicone hydrogel contact lens further comprises repeating units of a blending vinylic monomer, preferably selected from the group consisting of a $C_1$-$C_{10}$ alkyl (meth)acrylate,

cyclopentylacrylate, cyclohexylmethacrylate, cyclohexylacrylate, isobornyl (meth)acrylate, styrene, 4,6-trimethylstyrene (TMS), t-butyl styrene (TBS), trifluoroethyl (meth)acrylate, hexafluoro-isopropyl (meth)acrylate, hexafluorobutyl (meth)acrylate, and combinations thereof, more preferably being methyl methacrylate.

15. The silicone hydrogel contact lens of any one of claims 1 to 14, wherein the silicone hydrogel contact lens further comprises repeating units of at least one UV-absorbing vinylic monomer and optionally repeating units of at least one UV/HEVL-absorbing vinylic monomer.

16. The silicone hydrogel contact lens of any one of claims 1 to 15, wherein the silicone hydrogel contact lens further comprises repeating units of 2-[2'-hydroxy-5'-(2-methacryloxyethyl)phenyl)]-2H-benzotriazole (Norbloc) and repeating units of at least one UV/HEVL-absorbing vinylic monomer selected from the group consisting of 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-2/-/-benzotriazole, 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-methoxy-2/-/-benzotriazole (UV1 3), 2-{2'-Hydroxy-3'-fe/?-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-chloro-2/-/-benzotriazole (UV28), 2-[2'-Hydroxy-3'-fe/f-butyl-5'-(3'-acryloyloxypropoxy)phenyl]-5-trifluoromethyl-2/-/-benzotriazole (UV23), and combinations thereof.

17. The silicone hydrogel contact lens of any one of claims 1 to 16, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 10% or less (preferably about 5% or less, more preferably about 2.5% or less, even more preferably about 1% or less) between 280 and 315 nanometers and a UVA transmittance of about 30% or less (preferably about 20% or less, more preferably about 10% or less, even more preferably about 5% or less) between 315 and 380 nanometers and and a Violet transmittance of about 70% or less, preferably about 60% or less, more preferably about 50% or less, even more preferably about 40% or less) between 380 nm and 440 nm.

18. The silicone hydrogel contact lens of any one of claims 1 to 17, wherein the silicone hydrogel contact lens further comprises repeating units of one or more hydrophilic acrylic monomers selected from the group consisting of N,N-dimethyl (meth)acrylamide, (meth)acrylamide, N-hydroxylethyl (meth)acrylamide, N-hydroxypropyl (meth)acrylamide, hydroxyethyl (meth)acrylate, glycerol methacrylate (GMA), polyethylene glycol (meth)acrylate having a number average molecular weight of up to 1500, polyethylene glycol $C_{1-C4}$ -alkyl ether (meth)acrylate having a number average molecular weight of up to 1500, /V-[tris(hydroxymethyl)methyl]-acrylamide, (meth)acrylic acid, ethylacrylic acid, and combinations thereof (preferably selected from the group consisitng of N,N-dimethyl (meth)acrylamide, hydroxyethyl

(meth)acrylate, N-hydroxylethyl (meth)acrylamide, glycerol methacrylate (GMA), and combinations thereof).

19. A method for producing inherently-wettable silicone hydrogel contact lenses, comprising the steps of:

(1) preparing a polymerizable composition which is clear at room temperature and optionally but preferably at a temperature of from about 0 to about 4°C, wherein the polymerizable composition comprises

(a) at least one siloxane-containing vinylic monomer including 0 to 10 first H-donor moieties,

(b) at least one linear chain-extended polysiloxane vinylic crosslinker which has a number average molecular weight of from about 3000 Daltons to about 80,000 Daltons (preferably from about 4000 to about 40000 Daltons, more preferably from about 5000 to about 20000 Daltons) and comprises two terminal (meth)acryloyl groups and at least two polylsiloxane segments, wherein each pair of adjacent polysiloxane segments is linked by one divalent organic radical having one or more second H-donor moieties,

(c) at least one hydrophilic N-vinyl amide monomer,

(d) optionally at least one polysiloxane vinylic crosslinker having 0 to 35 third H-donor moieties, and

(d) at least one free radical initiator,

wherein the linear chain-extended polysiloxane vinylic crosslinker is different from the polysiloxane vinylic crosslinker, wherein the first, second and third H-donor moieties independent of one another are hydroxyl groups, carboxyl groups, amino groups of -NHR $^{0}$, amino linkages of -NH- , amide linkages of -CONH- , urethane linkages of -OCONH- , or combinations thereof, wherein R° is H or a $C_1$-$C_4$ alkyl,

wherein the polymerizable composition comprises at least 8.8 (preferably at least 9.0, more preferably at least 9.2, even more preferably at least 9.6) mmoles of component (c) per gram of all components (a), (b) and (d) in total and at least 0.11 (preferably at least 0.15, more preferably at least 0.20, even more preferably at least 0.25) meqs of the first, second and third H-donor moieties in total per gram of component (c);

(2) introducing the polymerizable composition into a lens mold; and

(3) curing thermally or actinically the polymerizable composition in the lens mold to form a silicone hydrogel contact lens,

wherein the silicone hydrogel contact lens has an oxygen permeability of at least 70 barrers (preferably at least 80 barrers, more preferably at least 90 barrers, even more preferably at least 100 barrers, most preferably at least 110 barrers), an elastic modulus of from about 0.2 MPa to about 1.5 MPa (preferably from about 0.3 MPa to about 1.2 MPa, more preferably from about 0.4 MPa to about 1.0 MPa), and an equilibrium water content of from about 40% to about 70% (preferably from about 43% to about 65% , more preferably from about 45% to about 60%) by weight and is inherently wettable as characterized by having a water-break-up-time of at least 10 seconds (preferably at least 15 seconds, more preferably at least 20 seconds) and a water contact angle by captive bubble of about 80 degrees or less (preferably about 75 degrees or less, more preferably about 70 degrees or less, even more preferably about 65 degrees or less, most preferably about 60 degrees or less) without being subjected to any post-curing surface treatment.

20. The method of claim 19, wherein the linear chain-extended polysiloxane vinylic crosslinker comprises two terminal (meth)acryloyl groups and from 2 to 20 polysiloxane segments each pair of which are linked via an organic radical having at least two H-donor moieties selected from group consisting of urethane linkage of -OCONH-, hydroxyl groups, carboxyl groups, amino groups of -NHR$^0$, amino linkages of -NH- , amide linkages of -CONH- , and combinations thereof, wherein the polysiloxane vinylic crosslinker.

21. The method of claim 19 or 20, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (1)

$$E_1\left[\underset{CH_3}{\overset{CH_3}{Si}}-O\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 1}L_3\right]_{\omega 1}\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{\upsilon 1}\underset{CH_3}{\overset{CH_3}{Si}}-E_1 \qquad (1)$$

in which:

$\upsilon 1$ is an integer of from 5 to 50 and $\omega 1$ is an integer of from 1 to 15; $L_3$ is a divalent radical of - $L_3$'-0-(C2H40}-^-C0NH-R2-(NHC0-PE-C0NH-R2)-NHC0-(0C2H4)-T0-L3'- q2 ;

PE is a divalent radical of

$-(CH_2CH_2O)_{q3}Z_0-CF_2-(OCF_2)_x-(OCF_2CF_2)_y-OCF_2-Z_0-(OCH_2CH_2)_{q3}-$ or

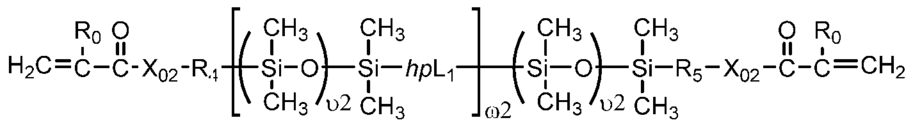
$-Z_0-(CH_2CH_2O)_{q4}-(CH_2-\overset{CH_3}{CH}-O)_{q5}-(CH_2-\overset{C_2H_5}{CH}-O)_{q6}-Z_0-$ ; $E_1$ is a monovalent radical of $H_2C=\overset{R_0}{C}-\overset{O}{C}-X_{01}-L_4-$ ; $L_4$ is a divalent radical of $-C_2H_4-NHCO-O-(C_2H_4O)_{q2}-L_3'-$,

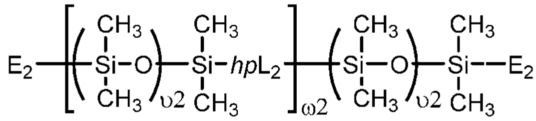
$-(C_2H_4O)_{q1}-CONH-R_2-NHCO-O-(C_2H_4O)_{q2}-L_3'-$ ,

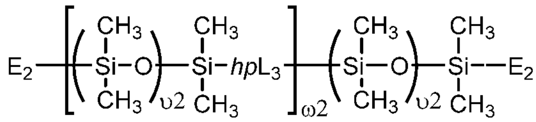
- $R_3$-0-CONH-R $_2$-NHCO-0-{C2H40)^ $_2$L3'- , -CH $_2$-CH(OH)-CH2-O^C2H$_4$o)-^-L.3'- , or

-(c $_2H_4O$)-2-L3'- ; Ro is H or methyl; $X_{01}$ is O or $NR_{n1}$; $R_{n1}$ is H or a C1-C10 alkyl; $R_2$ is a C4-C14 hydrocarbon divalent radical; R3 is a C2-C6 alkylene divalent radical; L3' is $C_3$-$C_8$ alkylene divalent radical; $Z_0$ is a direct bond or a C1-C12 alkylene divalent radical; g1 is 1 or zero; q1 is an integer of 1 to 20; q2 is an integer of 0 to 20; q3 is an integer of 0 to 2; q4 is an integer of 2 to 50, q5 and q6 independent of each other are a number of 0 to 35; provided that (q4+q5+q6) is an integer of 2 to 50; x+y is an integer of from 10 to 30.

22. The method of claim 19 or 20, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (2), (3) or (4)

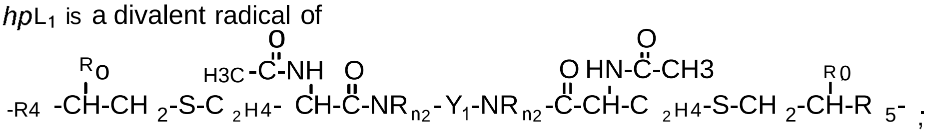

(2)


(3)

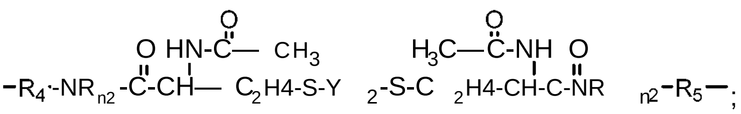

(4)

in which:

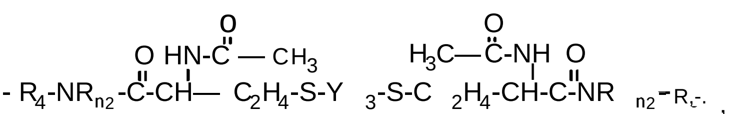
*hp*$L_1$ is a divalent radical of

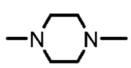
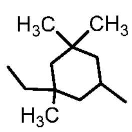


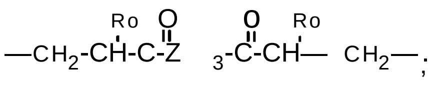
*hpL*$_2$ is a divalent radical of

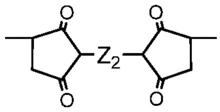


*hp*$L_3$ is a divalent radical of



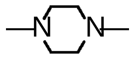
**Yi** is a **$C_1$-$C_6$** alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, a divalent radical of , or a divalent radical of ;

$Y_2$ is a divalent radical of ;

$Y_3$ is a divalent radical of $-CH_2-CH_2-S(=O)_2-(Z_1-S(=O)_2)_{m1}-CH_2-CH_2-$ or ;

$Z_1$ is a $C_1$-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical,

$Z_2$ is a $C_1$-$C_6$ alkylene divalent radical, a hydroxyl-or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, a dihydroxyl- or dimethoxy-substituted $C_2$-$C_6$ alkylene divalent radical, a divalent radical of $-C_2H_4-(O-C_2H_4)_{m2}-$, a divalent radical of $-Z_4-S-S-Z_4-$, a hydroxyl- or methoxy-substituted $C_1$-$C_6$ alkylene divalent radical, or a substituted or unsubstituted phenylene divalent radical,

$Z_3$ is a divalent radical of any one of (a) $-NR_{n3}-$, (b) , (c) $-NR_0-Z_5-NR_0-$, and (d) $-O-Z_6-O-$,

$Z_4$ is a C1-C6 alkylene divalent radical,

$Z_5$ is a $C_1$-$C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical,

$Z_6$ is (a) a $C_1$-$C_6$ alkylene divalent radical, (b) a divalent radical of

$-(CH_2-CH(OH)-CH_2-O)_{m3}-CH_2-CH(OH)-CH_2-$,

$-CH_2-CH(OH)-CH_2-O-CH_2-CH_2-O-CH_2-CH(OH)-CH_2-$, $-(CH_2-CH_2-O)_{m4}-CH_2-CH_2-$,

$-(CH_2)_{m5}-O-P(=O)(OH)-O-(CH_2)_{m5}-$, or (c) a substituted $C_3$-$C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group,

$Z_7$ is a divalent radical of $-Z_9-C(=O)-CH(R_0)-CH_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-R_4-$;

$Z_8$ is a divalent radical of $-Z_9-C(=O)-CH(R_0)-CH_2-S-C_2H_4-CH(NH-C(=O)-CH_3)-C(=O)-NR_{n2}-R_4-$

$E_2$ is a monovalent radical of $H_2C=C(R_0)-C(=O)-Z_7-$;

$\upsilon 2$ is an integer of from 5 to 50;

$\omega 2$ is an integer of from 1 to 15;

$X_{02}$ is O or $NR_{n2}$;

$R_0$ is hydrogen or methyl;

$R_{n2}$ is hydrogen or $C_1$-$C_4$-alkyl;

$R_{n3}$ is hydrogen or $C_1$-$C_3$ alkyl;

$R_4$ and $R_5$ independent of each other are a $C_1$-$C_6$ alkylene divalent radical or a $C_1$-$C_6$ alkylene-oxy -$C_1$-$C_6$ alkylene divalent radical;

m1 is 0 or 1, m2 is an integer of 1 to 6, m3 is 1 or 2, m4 is an integer of 1 to 5, m5 is 2 or 3.

23. The method of claim 19 or 20, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (5)

$$E_3 \left[ R_6 \left( \begin{matrix} CH_3 \\ | \\ Si \\ | \\ CH_3 \end{matrix} - O \right)_{\upsilon 3} \begin{matrix} CH_3 \\ | \\ Si \\ | \\ CH_3 \end{matrix} - R_2 - hpL_4 - pOAlk - hpL_4 \right]_{\omega 3} R_6 \left( \begin{matrix} CH_3 \\ | \\ Si \\ | \\ CH_3 \end{matrix} - O \right)_{\upsilon 3} \begin{matrix} CH_3 \\ | \\ Si \\ | \\ CH_3 \end{matrix} - R_7 - E_3 \quad (5)$$

in which:

$\upsilon 3$ is an integer of from 5 to 50;

$\omega 3$ is an integer of from 1 to 15;

E3 is a monovalent radical of $H_2C{=}\overset{R_0}{\overset{|}{C}}-\overset{O}{\overset{\|}{C}}-X_{03}-$ in which $R_0$ is hydrogen or methyl, $X_{03}$ is O or $NR_{n4}$, and $R_{n4}$ is hydrogen or $C_1$-$C_4$-alkyl;

$R_6$ and $R_7$ independent of each other are a $C_1$-$C_6$ alkylene divalent radical or a $C_1$-$C_6$ alkoxy-$C_1$-$C_6$ alkylene divalent radical;

pOAlk is a divalent radical of $-(EO)_{e1}(PO)_{p1}(BO)_{b1}-$ in which EO is an oxyethylene unit ($-CH_2CH_2O-$), PO is an oxypropylene unit ($-CH_2-\underset{CH_3}{\underset{|}{CH}}-O-$), and BO is an oxybutylene unit ($-CH_2-\underset{C_2H_5}{\underset{|}{CH}}-O-$), e1 is an integer of 5 to 100, p1 and b1 independent of each other are an integer of 0 to 50, provided that $(e1+p1+b1) \geq 10$ and $\frac{e1}{(p1+b1)} \geq 2$ (preferably from about 2:1 to about 10:1, more preferably from about 3:1 to about 6:1) when $(p1+b1) \geq 1$;

$hpL_4$ is a divalent radical of $-X_{03}-\overset{O}{\overset{\|}{C}}-\overset{R_0}{\overset{|}{CH}}-CH_2-S-C_2H_4-\underset{}{\overset{H_3C-\overset{O}{\overset{\|}{C}}-NH}{\overset{|}{CH}}}-\overset{O}{\overset{\|}{C}}-NR_{n4}-R_8-$ or $-R_9-NR_{n4}-\overset{O}{\overset{\|}{C}}-\overset{HN-\overset{O}{\overset{\|}{C}}-CH_3}{\overset{|}{CH}}-C_2H_4-S-CH_2-\overset{R_0}{\overset{|}{CH}}-\overset{O}{\overset{\|}{C}}-X_{03}-$ in which $R_8$ and $R_9$ independent of each other are a substituted or unsubstituted $C_1$-$C_{12}$ alkylene divalent radical.

24. The method of claim 19 or 20, wherein the linear chain-extended polysiloxane vinylic crosslinker is a vinylic crosslinker of formula (6)

$$E_4-\left[\left(\begin{matrix}CH_3\\ |\\ Si-O\\ |\\ CH_3\end{matrix}\right)_{\upsilon 4}-\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}-G_1-CH_2-\begin{matrix}R_0\\ |\\ CH\end{matrix}-S-J_0-S-\begin{matrix}R_0\\ |\\ CH\end{matrix}-CH_2-G_1\right]_{\omega 4}-\left(\begin{matrix}CH_3\\ |\\ Si-O\\ |\\ CH_3\end{matrix}\right)_{\upsilon 4}-\begin{matrix}CH_3\\ |\\ Si\\ |\\ CH_3\end{matrix}-E_4 \quad (6)$$

in which

v4 is an integer from 5 to 100;

$\omega 4$ is an integer of 1 to 15;

$R_0$ is hydrogen or methyl;

$J_0$ is a C1-C12 hydrocarbon radical having 0 to 2 hydroxyl or carboxyl groups;

$G_1$ is a direct bond, a C1-C4 alkylene divalent radical, or a bivalent radical of

$-X_{04}$-(C2H4o}$_{h}$j-CONH-M $_1$-NHCO-O-{C2H4O)jj2-M$_0$- ,

**-Xos-Mz-O-CONH-M^NHCO-O-iCz^O^Mo-** ,

$-X_{06}-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-$ , $-X_{07}-(C_2H_4O)_{h2}-M_0-$ ;

**$-X_{08}-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-$** , **$-X_{10}-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h2}-M_0-$** ,

$-X_{07}-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-$ , Qr

$-X_{08}-(C_2H_4O)_{h1}-CH_2-CH(OH)-CH_2-O-M_0-$ in which hi is an integer of 1 to 20; h2 is an integer of 0 to 20; $M_0$ is $C_3$-$C_8$ alkylene divalent radical; $M_1$ is a C4-C14 hydrocarbon divalent radical; $M_2$ and $M_3$ independent of each other are a Ci-C 6 alkylene divalent radical; $X_{04}$ is -COO- or -CONRns-; Rns is H or a C1-C10 alkyl; $X_{05}$ and Xo7 independent of each other are a direct bond, -COO- or -CONRns-; $X_{06}$ is a direct bond, a Ci-C 6 alkylene divalent radical, a Ci-C 6 alkylenoxy divalent radical, -COO-, or -CONRns-; $X_{08}$ is a direct bond or -COO-; $X_{09}$ is O or N R n5; X10 is a direct bond, a Ci-C 6 alkylene divalent radical, -COO-, or -CONRns-; Provided that $M_0$ is linked to Si atom while $X_{04}$ to $X_{10}$ are linked to the group of $-CH_2-$ in formula (6) and that at least one of $J_1$ and $G_1$ comprises at least one moieties selected from the group consisting of hydroxyl groups, urethane linkage of -OCONH- , amino groups of -NHR $^0$, amino linkages of -NH-, amide linkages of -CONH- , carboxyl groups, and combinations thereof;

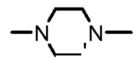
$E_4$ is a monovalent radical of $H_2C{=}\overset{R_0}{C}-\overset{O}{\overset{\|}{C}}-X_{11}-G_2-$ or $H_2C{=}\overset{R_0}{C}-\overset{O}{\overset{\|}{C}}-G_3-$;

$X_{11}$ is O or $NR_{n5}$;

$G_2$ is a C1-C4 alkylene divalent radical or a bivalent radical of

**$-(C_2H_4O)_{h1}-$**CONH-**$M_1$-NHCO-O** **$-(C_2H_4O)_{h2}-M_0-$** ,

$-M_2-O-CONH-M_1-NHCO-O-(C_2H_4O)_{h2}-M_0-$, $-CH_2-CH(OH)-CH_2-O-(C_2H_4O)_{h2}-M_0-$, $-(C_2H_4O)_{h1}-M_0-$, $-M_3-NHCOO-(C_2H_4O)_{h1}-M_0-$, $-CH_2-CH(OH)-CH_2-X_{09}-(C_2H_4O)_{h1}-M_0-$, $-M_3-X_{09}-CH_2-CH(OH)-CH_2-O-M_0-$, or $-(C_2H_4O)_{h1}-CH_2-CH(OH)-CH_2-O-M_0-$;

$G_3$ is a divalent radical of $-G_4\left(\overset{O}{\|}{C}\right)_{h3}\overset{R_0}{CH}-CH_2-S-J_0-S-CH_2-\overset{R_0}{CH}\left(\overset{O}{\|}{C}\right)_{h4}G_2-$ in which h3 and h4 independent of each other are 1 or 0, G4 is a divalent radical of any one of (a) $-NR_3-$ in which $R_3$ is hydrogen or $C_1-C_3$ alkyl, (b) , (c) $-NR''-G_5-NR''-$ in which R'' is hydrogen or methyl and $G_5$ is a $C_1-C_6$ alkylene divalent radical, 2-hydroxylpropylene divalent radical, 2-(phosphonyloxy)propylene divalent radical, 1,2-dihydroxyethylene divalent radical, 2,3-dihydroxybutylene divalent radical, and (d) $-O-G_6-O-$ in which $G_6$ is a $C_1-C_6$ alkylene divalent radical, a divalent radical of $-\left(CH_2-\overset{OH}{CH}-CH_2-O\right)_{h4}CH_2-\overset{OH}{CH}-CH_2-$ in which h4 is 1 or 2, a divalent radical of $-CH_2-\overset{OH}{CH}-CH_2-O-CH_2-CH_2-O-CH_2-\overset{OH}{CH}-CH_2-$, a divalent radical of $-\left(CH_2-CH_2-O\right)_{h5}CH_2-CH_2-$ in which h5 is an integer of 1 to 5, a divalent radical of $-\left(CH_2\right)_{h6}O-\overset{O}{\overset{\|}{P}}(OH)-O\left(CH_2\right)_{m5}-$ in which h6 is 2 or 3, or a substituted $C_3-C_8$ alkylene divalent radical having a hydroxyl group or phosphonyloxy group.

25. The method of any one of claims 19 to 24, the siloxane-containing vinylic monomer is a mono-(meth)acryloyl-terminated, monoalkyl-terminated polysiloxane of formula (I)

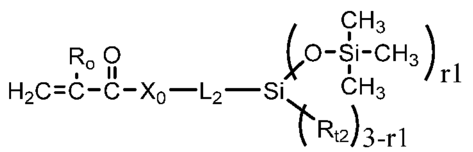
$$H_2C=\overset{R_o}{C}-\overset{O}{\overset{\|}{C}}-X_0-L_1-\left(\underset{CH_3}{\overset{CH_3}{Si}}-O\right)_{n1}\underset{CH_3}{\overset{CH_3}{Si}}-R_{t1} \qquad \text{(I)}$$

in which: $R_0$ is H or methyl; $X_0$ is O or $NR_1$; $L_1$ is a $C_3-C_8$ alkylene divalent radical or a divalent radical of $-L_1'-X_1-L_1''-$, $-(C_2H_4O)_{q1}-L_1''-$, $-(C_2H_4O)_{q1}-CONH-L_1''-$, $-L_1'-NHCOO-(C_2H_4O)_{q1}-L_1''-$, $-CH_2-CH(OH)-CH_2-X_1'-(C_2H_4O)_{q2}-L_1''-$, $-L_1'-X_1'-CH_2-CH(OH)-CH_2-O-L_1''-$, or $-(C_2H_4O)_{q1}-CH_2-CH(OH)-CH_2-O-L_1''-$; $L_1'$ is a $C_2-C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_1''$ is $C_3-C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, $NR_1$, NHCOO, OCONH, CONR1 , or NR1CO; $R_1$ is H or a C1-C4 alkyl having 0 to 2 hydroxyl group; $R_{t1}$ is a C1-C4 alkyl; qi is an integer of 1 to 20, n1 is an integer of 3 to 25 (preferably 3 to 20, more preferably 3 to 15, even more preferably 3 to 10).

26. The method of claim 25, wherein the mono-(meth)acryloyl-terminated , monoalkyl-terminated polysiloxane is mono-3-(meth)acryloxypropyl terminated mono-butyl terminated polydimethylsiloxane, mono-3-(meth)acryloxypropyl terminated mono-methyl terminated polydimethylsiloxane, mono-3-(meth)acryloxy-2-hydroxypropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, mono-3-(meth)acryloxy-2-hydroxypropyloxypropyl terminated , mono-methyl terminated polydimethylsiloxane, a-(2-hydroxyl-methacryloxypropyloxypropyl)-u>butyl-decamethylpentasiloxane, N-methyl-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, N-(2,3-dihydroxypropane)-N'-(propyltetra(dimethylsiloxy)dimethylbutylsilane) (meth)acrylamide, (meth)acryloylamidopropyltetra(dimethylsiloxy)dimethylbutylsilane, mono-(meth)acryloylamidopropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, mono-N-methyl-(meth)acryloylamidopropyloxypropyl terminated , mono-butyl terminated polydimethylsiloxane, mono-3-(meth)acryloylamido-2-hydroxypropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, mono-3-[N-methyl-(meth)acryloylamido]-2-hydroxypropyloxypropyl terminated, mono-butyl terminated polydimethylsiloxane, or a mixture thereof.

27. The method of any one of claims 19 to 24, wherein the siloxane containing vinylic monomers is a vinylic monomer containing a tris(trimethylsilyloxy)silyl or bis(trimethylsilyloxy)alkylsilyl group.

28. The method of claim 27, wherein the siloxane-containing vinylic monomer is a tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer of formula (II)




(II)

in which: $R_0$ is H or methyl; $X_0$ is O or NRi ; L2 is a C3-C8 alkylene divalent radical or a divalent radical of or -L2 '-X2-L2"-, -(C $_2H_4$0 $)_q$i-L2"-, -(C2H $_4$0 $)_q$i-CONH-L2"-; or - $L_2$'-NHCOO-(C2H $_4$0)qi-L2"-, $L_2$' is a $C_2$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $L_2$" is $C_3$-$C_8$ alkylene divalent radical which has zero or one hydroxyl group; $X_1$ is O, NRi , NHCOO, OCONH, CONR1 , or NR1CO; $R_1$ is H or a C1-C4 alkyl having 0 to 2 hydroxyl group; $R_t$2 is a C1-C4 alkyl; q1 is an integer of 1 to 20, r1 is an integer of 2 or 3.

29. The method of claim 27 or 28, wherein the tris(trimethylsilyloxy)silyl-containing or bis(trimethylsilyloxy)alkylsilyl-containing vinylic monomer is selected from the group consisting of tris(trimethylsilyloxy)silylpropyl (meth)acrylate, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)methylsilane, [3-(meth)acryloxy-2-hydroxypropyloxy]propylbis(trimethylsiloxy)butylsilane, 3-(meth)acryloxy-2-(2-hydroxyethoxy)-propyloxy)propylbis(trimethylsiloxy)methylsilane, N-[tris(trimethylsiloxy)silylpropyl]-(meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl)-2-methyl (meth)acrylamide, N-(2-hydroxy-3-(3-(bis(trimethylsilyloxy)methylsilyl)propyloxy)propyl) (meth)acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl)-2-methyl acrylamide, N-(2-hydroxy-3-(3-(tris(trimethylsilyloxy)silyl)propyloxy)propyl) (meth)acrylamide, and mixtures thereof.

30. The method of any one of claims 19 to 29, wherein the hydrophilic N-vinyl amide monomer is N-vinylpyrrolidone, N-vinyl piperidone, N-vinyl caprolactam, N-vinyl-N-methyl acetamide, N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, N-vinyl-N-ethyl acetamide, N-vinyl-N-ethyl formamide, and mixtures thereof (preferably is N-vinylpyrrolidone, N-vinyl-N-methyl acetamide, or combinations thereof).

31. The method of any one of claims 19 to 30, wherein the polymerizable composition further comprises one or more non-silicone vinylic crosslinking agents (preferably selected from the group consisting of ethyleneglycol di-(meth)acrylate, diethyleneglycol di-(meth)acrylate, triethyleneglycol di-(meth)acrylate, tetraethyleneglycol di-(meth)acrylate, glycerol di-(meth)acrylate, 1,3-propanediol di-(meth)acrylate, 1,3-butanediol di-(meth)acrylate, 1,4-butanediol di-(meth)acrylate, glycerol 1,3-diglycerolate di-(meth)acrylate, ethylenebis[oxy(2-hydroxypropane-1 ,3-diyl)] di-(meth)acrylate, bis[2-(meth)acryloxyethyl] phosphate, trimethylolpropane di-(meth)acrylate, and 3,4-bis[(meth)acryloyl]tetrahydrofuan , diacrylamide, dimethacrylamide, N,N-di(meth)acryloyl-N-methylamine, N,N-di(meth)acryloyl-N-ethylamine, N,N'-methylene bis(meth)acrylamide, N,N'-ethylene bis(meth)acrylamide, N,N'-dihydroxyethylene bis(meth)acrylamide, N,N'-propylene bis(meth)acrylamide, N,N'-2-hydroxypropylene bis(meth)acrylamide, N,N'-2,3-dihydroxybutylene bis(meth)acrylamide, 1,3-bis(meth)acrylamidepropane-2-yl dihydrogen phosphate, piperazine diacrylamide, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, triallyl cyanurate, trimethylopropane trimethaerylate, pentaerythritol tetramethacrylate, bisphenol A dimethaerylate, and combinations thereof, more preferably selected from the group consisting of tetra(ethyleneglycol) di-(meth)acrylate, tri(ethyleneglycol) di-

(meth)acrylate, ethyleneglycol di-(meth)acrylate, di(ethyleneglycol) di-(meth)acrylate, tetraethyleneglycol divinyl ether, triethyleneglycol divinyl ether, diethyleneglycol divinyl ether, ethyleneglycol divinyl ether, triallyl isocyanurate, or triallyl cyanurate).

32. The method of any one of claims 19 to 31, wherein the polymerizable composition further comprises a blending vinylic monomer (preferably selected from the group consisting of a $C_1$-$C_{10}$ alkyl (meth)acrylate, cyclopentylacrylate, cyclohexylmethacrylate, cyclohexylacrylate, isobornyl (meth)acrylate, styrene, 4,6-trimethylstyrene (TMS), t-butyl styrene (TBS), trifluoroethyl (meth)acrylate, hexafluoro-isopropyl (meth)acrylate, hexafluorobutyl (meth)acrylate, and combinations thereof, more preferably selected from methyl methacrylate).

33. The method of any one of claims 19 to 32, wherein the polymerizable composition further comprises at least one UV-absorbing vinylic monomer and optionally at least one UV/HEVL-absorbing vinylic monomer.

34. The method of any one of claims 19 to 33, wherein the polymerizable composition further comprises 2-[2'-hydroxy-5'-(2-methacryloxyethyl)phenyl)]-2H-benzotriazole (Norbloc) and at least one UV/HEVL-absorbing vinylic monomer selected from the group consisting of 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-2H-benzotriazole, 2-{2'-Hydroxy-3'-fe/f-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-methoxy-2H-benzotriazole (UV1 3), 2-{2'-Hydroxy-3'-fe/?-butyl-5'-[3'-methacryloyloxypropoxy]phenyl}-5-chloro-2/-/-benzotriazole (UV28), 2-[2'-Hydroxy-3'-fe/f-butyl-5'-(3'-acryloyloxypropoxy)phenyl]-5-trifluoromethyl-2/-/-benzotriazole (UV23), and combinations thereof.

35. The method of any one of claims 19 to 34, wherein the silicone hydrogel contact lens is characterized by having the UVB transmittance of about 10% or less (preferably about 5% or less, more preferably about 2.5% or less, even more preferably about 1% or less) between 280 and 315 nanometers and a UVA transmittance of about 30% or less (preferably about 20% or less, more preferably about 10% or less, even more preferably about 5% or less) between 315 and 380 nanometers and and a Violet transmittance of about 70% or less, preferably about 60% or less, more preferably about 50% or less, even more preferably about 40% or less) between 380 nm and 440 nm.

36. The method of any one of claims 19 to 35, wherein the polymerizable composition further comprises one or more hydrophilic acrylic monomers selected from the group consisting of N,N-dimethyl (meth)acrylamide, (meth)acrylamide, N-hydroxylethyl (meth)acrylamide, N-hydroxypropyl (meth)acrylamide, hydroxyethyl (meth)acrylate, glycerol methacrylate (GMA), polyethylene glycol (meth)acrylate having a number average molecular weight of up to 1500, polyethylene glycol $C_{1}$-$C_{4}$ -alkyl ether

(meth)acrylate having a number average molecular weight of up to 1500, *N*-[tris(hydroxymethyl)methyl]-acrylamide, (meth)acrylic acid, ethylacrylic acid, and combinations thereof (preferably selected from the group consisitng of N,N-dimethyl (meth)acrylamide, hydroxyethyl (meth)acrylate, N-hydroxylethyl (meth)acrylamide, glycerol methacrylate (GMA), and combinations thereof).

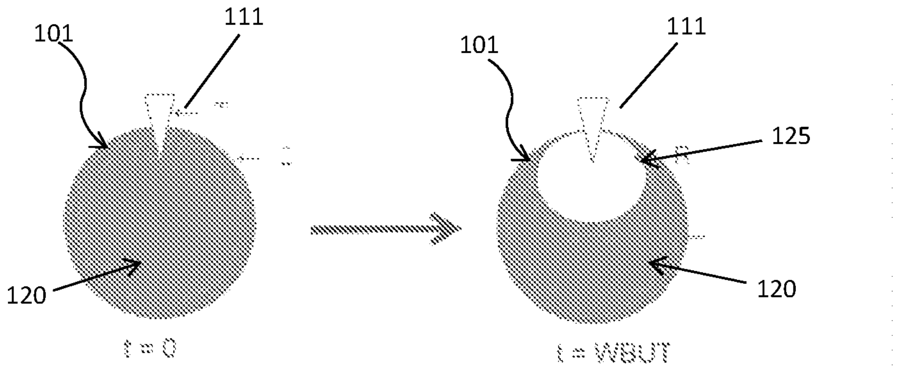



Figure 1

# INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/054046

**A. CLASSIFICATION OF SUBJECT MATTER**
INV. GO2B1/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)
G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 2016/062142 AI (ZHANG STEVE YUN [US] ) 3 March 2016 (2016-03-03) example 2; table 1 ----- | 1-36 |
| A | WO 2007/146312 A2 (C00PERVISION INT HOLDING CO LP [BB]; HONG YE [US]; CHEN CHARLIE [US];) 21 December 2007 (2007-12-21) contact lenses comprising M3U, SiGMA and NVP; paragraph [0187]; example 27 ref. to example 27 in table; combination of oxygen permeability, elastic modulus, EWC and contact angle; paragraph [0252]; example 60 ----- | 1-36 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 11 September 2018 | 21/09/2018 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Stabel, Andreas |

1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2018/054046

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| WO 2007146312 A2 | 21-12-2007 | BR PI0711964 A2 | 24-01-2012 |
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