What is claimed is:CLAIMS

1. A method for producing embedded or hybrid silicone hydrogel contact lenses, wherein each embedded silicone hydrogel contact lens has at least one insert embedded therein, wherein each hybrid silicone hydrogel contact lens consists essentially of one central optical zone of a rigid gas permeable material and one peripheral zone of a silicone hydrogel material surrounding the central optical zone, comprising the steps of:

(1) obtaining a polymerizable composition for forming a silicone hydrogel material, wherein the polymerizable composition comprising from about 1% to about 25% (preferably from about 2.0% to about 20%, more preferably from about 3.0% to about 17.5%, even more preferably from about 4.0% to about 15%) by weight of at least one polymeric non-reactive diluent (relative to the total weight of the polymerizable composition) and polymerizable materials dissolved in (or blended with) the polymeric diluent, wherein the polymerizable materials comprise (a) at least one silicone-containing vinylic monmer and/or at least one silicone-containing vinylic crosslinker and (b) at least one hydrophilic vinylic monomer, wherein said at least one polymeric non-reactive diluent comprises a poly(C_2-C_4 alkyleneoxide) polymer;

(2) obtaining a lens mold, wherein the lens mold comprises a male mold half having a first molding surface and a female mold half having a second molding surface, wherein the male and female mold halves are configured to receive each other such that a mold cavity is formed between the first and second molding surfaces when the mold is closed;

(3) obtaining an insert or a disk, wherein the insert is made of a non-hydrogel material, wherein the disk is made of the rigid gas permeable material and has a first surface matching a central area of the first molding surface and an opposite second surface matching a central area of the second molding surface;

(4) in no particular order, placing the insert or the disk at a specified position in the lens mold and introducing the polymerizable composition in the lens mold, wherein the insert is immersed in the polymerizable composition in the lens mold, wherein the disk is surrounded by the first and second molding surfaces and the polymerizable composition in the lens mold;

(5) curing the polymerizable composition in the lens mold to form an unprocessed embedded or hybrid silicone hydrogel contact lens, wherein the unprocessed embedded silicone hydrogel contact lens has the insert surrounded by the silicone

hydrogel material, wherein the unprocessed hybrid silicone hydrogel contact lens consists essentially of one central optical zone of the rigid gas permeable material and a peripheral zone of the silicone hydrogel material surrounding the central optical zone;

(6) separating the lens mold obtained in step (5) into the male and female mold halves, with the unprocessed embedded or hybrid silicone hydrogel contact lens adhered on a lens-adhered mold half which is one of the male and female mold halves;

(7) removing the unprocessed embedded or hybrid silicone hydrogel contact lens from the lens-adhered mold half; and

(8) subjecting the unprocessed embedded or hybrid silicone hydrogel contact lens to post-molding processes including a hydration process and one or more other processes selected from the group consisting of extraction, surface treatment, packaging, sterilization, and combinations thereof.

2. The method of claim 1, wherein the unprocessed hybrid silicone hydrogel contact lens is mechanically removed from the lens-adhered mold half.

3. The method of claim 2, wherein the step of removing the unprocessed hybrid silicone hydrogel contact lens from the lens-adhered mold half is aided by blowing cold air over the unprocessed hybrid silicone hydrogel contact lens and/or the lens-adhered mold half.

4. The method of any one of claims 1 to 3, wherein the step of curing the polymerizable composition in the lens mold is carried out actinically by irradiating the polymerizable composition in the mold with a UV light or a visible light.

5. The method of any one of claims 1 to 3, wherein the step of curing the polymerizable composition in the lens mold is carried out thermally in an oven at a temperature of from 25 to 120°C (preferably 40 to 100°C) for from about 1 to 24 hours.

6. The method of claim 5, wherein the step of curing is carried out under an inert atmosphere (e.g., under N_2 or Ar atmosphere).

7. The method of any one of claims 1 to 6, wherein the amount of the polymeric non-reactive diluent in the polymerizable composition is sufficient for providing the unprocessed embedded silicone hydrogel contact lens with a water-swelling degree of from about -7% to about 7%.

8. The method of any one of claims 1 to 7, wherein the polymerizable composition comprises less than 10% by weight of any non-reactive diluent other than the polymeric non-reactive diluent.

9. The method of any one of claims 1 to 8, wherein the polymerizable composition comprises: (i) from about 20% to about 79% by weight of said at least one silicone-containing vinylic monomer and/or said at least one silicone-containing vinylic crosslinker (relative to the total weight of the polymerizable composition); (ii) from 20% to about 79% by weight of the hydrophilic vinylic monomer (relative to the total weight of the polymerizable composition); (iii) from 0 to about 2.5 by weight of at least one non-silicone vinylic crosslinker (relative to the total weight of the polymerizable composition); (iv) from 0 to about 15% by weight of at least one blending vinylic monomer (relative to the total weight of the polymerizable composition), preferably wherein said at least one blending vinylic monomer is methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, isopropyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, pentyl (meth)acrylate, hexyl (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 (more preferably wherein said at least one blending vinylic monomer is methyl methacrylate); (v) from 0 to about 3.0% by weight of at least one UV-absorbing vinylic monomer and/or at least one UV/HEVL-absorbing vinylic monomer (relative to the total weight of the polymerizable composition); or (vi) combinations thereof.

10. The method of any one of claims 1 to 9, wherein the sum of the amounts of polymerizable materials (a) and (b) is at least 70% by weight relative to the total amount of all polymerizable materials in the polymerizable composition.

11. An unprocessed embedded silicone hydrogel contact lens, comprising:

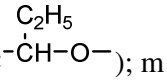
a silicone hydrogel material; at least one insert; and from about 0.5% to about 24% by weight of at least one polymeric non-reactive diluent relative to the total weight of the unprocessed embedded silicone hydrogel contact lens, wherein the silicone hydrogel material is a crosslinked material that has a polymer matrix and comprises (a) repeating units of at least one silicone-containing vinylic monomer and/or at least one silicone-containing vinylic crosslinker and (b) repeating units of at least one hydrophilic vinylic monomer, wherein the insert is made of a non-hydrogel material and is surrounded by the silicone hydrogel material, wherein said at least one polymeric non-reactive diluent is distributed within the polymer matrix of the silicone hydrogel material and comprises a poly(C_2-C_4-alkyleneoxide) polymer, wherein the unprocessed embedded silicone hydrogel contact lens is capable of absorbing from about 15% to about 70% by weight

of water when being fully hydrated, wherein the unprocessed embedded silicone hydrogel contact lens has a water-swelling degree of from about -7% to about 7%.

1211. An unprocessed hybrid silicone hydrogel contact lens, consisting essential of two zones:

a central optical zone that is made of a rigid gas permeable material; and a peripheral zone that is made of a silicone hydrogel material and surrounds the central optical zone (like a skirt), wherein the unprocessed hybrid silicone hydrogel contact lens comprises from about 0.25% to about 20% by weight of at least one polymeric non-reactive diluent relative to the total weight of the unprocessed hybrid silicone hydrogel contact lens, wherein the silicone hydrogel material is a crosslinked material that has a polymer matrix and comprises (a) repeating units of at least one silicone-containing vinylic monomer and/or at least one silicone-containing vinylic crosslinker and (b) repeating units of at least one hydrophilic vinylic monomer, wherein said at least one polymeric non-reactive diluent is distributed within the polymer matrix of the silicone hydrogel material and comprises a poly(C_2-C_4 alkyleneoxide) polymer, wherein the unprocessed hybrid silicone hydrogel contact lens is capable of absorbing from about 10% to about 60% by weight of water when being fully hydrated, wherein the unprocessed hybrid silicone hydrogel contact lens has a water-swelling degree of from about -7% to about 7%.

1312. The unprocessed hybrid silicone hydrogel contact lens of claim 12 or the unprocessed embedded silicone hydrogel contact lens of claim 11, wherein the unprocessed embedded or hybrid silicone hydrogel contact lens is capable of absorbing from about 15% to about 60% by weight of water when being fully hydrated.

1413. The method of any one of claims 1 to 10, or the unprocessed embedded silicone hydrogel contact lens of claim 11 or 13, or the unprocessed hybrid silicone hydrogel contact lens of claim 11 or 12 or 13, wherein at least one poly(C_2-C_4 alkyleneoxide) polymer is represented by formula of R_1-O-$(EO)_{m1}(PO)_{n1}(BO)_{p1}$-$R_2$ in which: R_1 and R_2 independent of each other is hydrogen or a C_1-C_4 alkyl (preferably hydrogen or methyl); EO is a divalent radical of ethyleneoxide (); PO is a divalent radical of propyleneoxide (); BO is a divalent radical of butyleneoxide (); m1 is zero or an integer of from 5 to 65; n1 is zero or an integer of from 5 to 52; p1 is zero or integer of from 5 to 30; wherein if n1 is not zero, p1 is zero;

wherein if p1 is not zero, n1 is zero and m1 is not zero; wherein (m1+n1+p1) is a value to provide the poly(C_2-C_4 alkyleneoxide) polymer with a number average molecular weight of from about 300 to about 3000 Daltons (preferably from about 400 to about 2500 Daltons, more preferably from about 400 to about 2000 Daltons, even more preferably from about 400 to about 1500 Daltons).

15. The method of any one of claims 1 to 10 and 13, or the unprocessed hybrid silicone hydrogel contact lens of any one of claims 11 to 13, wherein at least one poly(C_2-C_4 alkyleneoxide) polymer is poly(ethyleneoxide) ("PEO"), poly(propyleneoxide) ("PPO"), poly(ethyleneoxide)-poly(propyleneoxide) di-block copolymer ("PEO-PPO"), poly(ethyleneoxide)-poly(propyleneoxide)-poly(ethyleneoxide) tri-block copolymer ("PEO-PPO-PEO"), poly(propyleneoxide)-poly(ethyleneoxide)-poly(propyleneoxide) tri-block copolymer ("PPO-PEO-PPO"), poly(ethyleneoxide)-poly(butyleneoxide) di-block copolymer ("PEO-PBO"), poly(ethyleneoxide)-poly(butyleneoxide)-poly(ethyleneoxide) tri-block copolymer ("PEO-PBO-PEO"), poly(butyleneoxide)-poly(ethyleneoxide)-poly(butyleneoxide) tri-block copolymer ("PBO-PEO-PBO"), or a mixture thereof.

16. The method of any one of claims 1 to 10, 13 and 15, or the unprocessed hybrid silicone hydrogel contact lens of any one of claims 11 to 14, wherein at least one poly(C_2-C_4 alkyleneoxide) polymer is poly(propyleneoxide) ("PPO").

17. The method of any one of claims 1 to 10 and 13 to 15, or the unprocessed hybrid silicone hydrogel contact lens of any one of claims 11 to 15, wherein said at least one silicone-containing vinylic monomer is a vinylic monomer having a bis(trialkylsilyloxy)alkylsilyl group or a tris(trialkylsilyloxy)silyl group, a polysiloxane vinylic monomer, a polycarbosiloxane vinylic monomer, 3-methacryloxy propylpentamethyldisiloxane, t-butyldimethyl-siloxyethyl vinyl carbonate, trimethylsilylethyl vinyl carbonate, trimethylsilylmethyl vinyl carbonate, or combinations thereof, wherein said at least one silicone-containing vinylic monomer is a polysiloxane vinylic crosslinkers, a polycarbosiloxane vinylic crosslinker, or combinations thereof; wherein said at least one hydrophilic vinylic monomer comprises an alkyl (meth)acrylamide, a hydroxyl-containing acrylic monomer, an amino-containing acrylic monomer, a carboxyl-containing acrylic monomer, a N-vinyl

amide monomer, a methylene-containing pyrrolidone monomer, an acrylic monomer having a C_1-C_4 alkoxyethoxy group, a vinyl ether monomer, an allyl ether monomer, a phosphorylcholine-containing vinylic monomer, N-2-hydroxyethyl vinyl carbamate, N-carboxyvinyl-β-alanine (VINAL), N-carboxyvinyl-α-alanine, or combinations thereof.

18. The method of any one of claims 1 to 10 and 14 to 17, or the unprocessed embedded silicone hydrogel contact lens of any one of claims 11 and 13 to 16, or the unprocessed hybrid silicone hydrogel contact lens of any one of claims 11 to 16, wherein the unprocessed embedded or hybrid silicone hydrogel contact lens comprises repeating units of at least one non-silicone vinylic crosslinker 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, triallyl cyanurate, and combinations thereof.

19. The method of any one of claims 1 to 10 and 14 to 18, or the unprocessed embedded silicone hydrogel contact lens of any one of claims 11 and 13 to 17, wherein the insert is a thin RGP disk for providing rigid center optics for masking astigmatism like a RGP contact lens, a multifocal lens insert, a liquid meniscus lens insert, an electro-wetting lens insert, a liquid crystal lens insert, an electro-active lens insert, an electronics insert, an electrode insert, a battery insert, an antennae insert, a circuit insert, a MEM device insert, a sensor insert, an energy receptor insert, a silicone rubber disk having at least one insert embedded therein, a RGP disk having at least one insert embedded therein, or combinations thereof.

20. The method of any one of claims 1 to 10 and 14 to 19, or the unprocessed embedded silicone hydrogel contact lens of any one of claims 11 and 13 to 18, wherein the insert has a thickness less than any thickness of the embedded silicone hydrogel contact lens in a region of the unprocessed embedded silicone hydrogel contact lens where the insert is embedded.

21. The method of any one of claims 1 to 10 and 14 to 20, or the unprocessed embedded silicone hydrogel contact lens of any one of claims 11 and 13 to 19, wherein the insert is made of a hard plastics, a gas permeable material, a soft plastics, a silicone rubber or elastomer, quartz, glass, a silicate material, a ceramic, a metal, a metal oxide, and a carbon material.

22. The method or the unprocessed embedded silicone hydrogel contact lens of claim 18,

wherein the insert is a thin RGP disk for providing rigid center optics for masking astigmatism like a RGP contact lens, wherein the RGP disk comprises at least one insert selected from the group consisting of multifocal lens inserts, liquid meniscus lens inserts, electro-wetting lens inserts, liquid crystal lens inserts, electro-active lens inserts, electronics inserts, electrode inserts, battery inserts, antennae inserts, circuit inserts, MEM device inserts, sensor inserts, energy receptor inserts, and combinations thereof.