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 1% to 25% 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 for from 1 to 24 hours.

6. The method of claim 5, wherein the step of curing is carried out 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 -7% to 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 20% to 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 79% by weight of the hydrophilic vinylic monomer relative to the total weight of the polymerizable composition; (iii) from 0 to 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 15% by weight of at least one blending vinylic monomer relative to the total weight of the polymerizable composition, 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, t-butyl styrene, trifluoroethyl (meth)acrylate, hexafluoro-isopropyl (meth)acrylate, hexafluorobutyl (meth)acrylate, or combinations thereof; (v) from 0 to 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 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, wherein the unprocessed hybrid silicone hydrogel contact lens comprises from 0.25% to 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 10% to 60% by weight of water when being fully hydrated, wherein the unprocessed hybrid silicone hydrogel contact lens has a water-swelling degree of from -7% to 7%.

12. The unprocessed hybrid silicone hydrogel contact lens of claim 11, wherein the

unprocessed embedded or hybrid silicone hydrogel contact lens is capable of absorbing from 15% to 60% by weight of water when being fully hydrated.

13. The method of any one of claims 1 to 10, or the unprocessed hybrid silicone hydrogel contact lens of claim 11 or 12, 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 ($-CH_2-CH_2-O-$); PO is a divalent radical of propyleneoxide ($-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-O-$); BO is a divalent radical of butyleneoxide ($-CH_2-\underset{\displaystyle C_2H_5}{\underset{|}{CH}}-O-$); 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 300 to 3000 Daltons.

14. 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.

15. The method of any one of claims 1 to 10, 13 and 14, 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").

16. 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, N-carboxyvinyl-α-alanine, or combinations thereof.

17. The method of any one of claims 1 to 10 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.

18. The method of any one of claims 1 to 10 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.

19. The method of any one of claims 1 to 10 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.

20. The method of any one of claims 1 to 10 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.

21. The method 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.