

What is claimed is:

1. A method for producing soft contact lenses, comprising the steps of:
 - (1) obtaining a plasma-treated silicone hydrogel contact lens which has a silicone hydrogel lens body and a plasma base coating thereon, wherein the silicone hydrogel lens body is essentially made of a silicone hydrogel material, wherein the plasma base coating has a thickness of from about 0.5 nm to about 40 nm;
 - (2) contacting the plasma-treated silicone hydrogel contact lens with a first aqueous coating solution including a poly(alkylacrylic acid)polymer at a coating temperature of from about 40°C to about 50°C for a contacting time of from about 60 minutes to about 300 minutes to form a soft contact lens precursor which is the plasma-treated silicone hydrogel contact lens additionally having a layer of poly(alkylacrylic acid) on top of the plasma base coating, wherein the first aqueous coating solution has a pH from 2.3 to 5.0 and the poly(alkylacrylic acid)polymer is a homopolymer or copolymer of methacrylic acid, ethyl acrylic acid or 2-(meth)acrylamidoglycolic acid, provided that the first aqueous coating solution includes one or more non-polymeric acids in a total amount for having an acid-induced change in elastic modulus, ΔE , of not greater than 15%, wherein $\Delta E = \left| \frac{E_i - E_0}{E_0} \right| \times 100\%$ in which E_i is the elastic modulus of the plasma-treated silicone hydrogel contact lens after being in contact with the first aqueous coating solution at the coating temperature for the contacting time and E_0 is the elastic modulus of the plasma-treated silicone hydrogel contact lens prior to contacting with the first aqueous coating solution; and
 - (3) heating the soft contact lens precursor obtained in step (2), in a second aqueous coating solution which comprises a water-soluble and thermally-crosslinkable hydrophilic polymeric material having azetidinium groups, at a temperature of from about 60°C to about 140°C for at least 30 minutes to crosslink the water-soluble thermally-crosslinkable hydrophilic polymeric material and the poly(alkylacrylic acid) polymer so as to form the soft contact lens with the composite coating thereon, wherein the composite coating comprises the plasma base coating and a hydrogel coating on top of the plasma base coating,

wherein the soft contact lens in fully hydrated state has a friction rating of about 3 or lower after 7 cycles of manual rubbing test.
2. The method of claim 1, wherein the plasma-treated silicone hydrogel contact lens is obtained by treating a silicone hydrogel contact lens in dried state with a plasma generated in a plasma gas composed of a mixture of a C₁-C₆ hydrocarbon and a secondary gas selected from the group consisting of air, N₂, O₂, CO₂, and combinations thereof.

3. The method of claim 1 or 2, wherein the poly(alkylacrylic acid) has a weight average molecular weight of at least 100,000 Daltons.
4. The method of any one of claims 1 to 3, wherein the plasma-treated silicone hydrogel contact lens is in dried state immediately before being in contact with the first aqueous coating solution.
5. The method of any one of claims 1 to 4, wherein the plasma-treated silicone hydrogel contact lens is in fully hydrated state immediately before being in contact with the first aqueous coating solution.
6. The method of any one of claims 1 to 5, wherein the step of heating is performed by autoclaving the soft contact lens precursor immersed in the second aqueous coating solution in a sealed lens package at a temperature of from about 115°C to about 125°C for approximately 20-90 minutes, wherein the second aqueous coating solution is a buffered aqueous solution with a pH of from 6.7 to 7.6.
7. The method of any one of claims 1 to 6, wherein the water-soluble thermally-crosslinkable polymeric material comprises
 - (i) from about 20% to about 95% by weight of first polymer chains derived from a polyamidoamine-epichlorohydrin or a poly(2-oxazoline-co-ethyleneimine)-epichlorohydrin or a combination thereof,
 - (ii) from about 5% to about 80% by weight of hydrophilic moieties and/or second polymer chains,
wherein each of the hydrophilic moieties is derived from at least one first hydrophilicity-enhancing agent having at least one reactive functional group selected from the group consisting of primary amino group, secondary amino group, carboxyl group, thiol group, and combination thereof, wherein the hydrophilic moieties are covalently attached to the first polymer chains through one or more covalent linkages each formed between one azetidinium group of the polyamidoamine-epichlorohydrin and one primary or secondary amino, carboxyl or thiol group of the first hydrophilicity-enhancing agent,
wherein each of the second polymer chains is derived from at least one second hydrophilicity-enhancing agent having at least one reactive functional group selected from the group consisting of primary amino group, secondary amino group, carboxyl group, thiol group, and combination thereof, wherein the second polymer chains are covalently attached to the first polymer chains through one or more covalent linkages each formed between one azetidinium group of the polyamidoamine-epichlorohydrin and one primary or secondary amino, carboxyl or thiol group of the second hydrophilicity-enhancing agent, and
 - (iii) azetidinium groups which are parts of the first polymer chains or pendant or

terminal groups covalently attached to the first polymer chains.

8. The method of claim 7, wherein the second hydrophilicity-enhancing agent is: a polyethylene glycol having one sole primary or secondary amino, carboxyl or thiol group; a polyethylene glycol with two terminal primary or secondary amino, carboxyl and/or thiol groups; a multi-arm polyethylene glycol with one or more primary or secondary amino, carboxyl and/or thiol groups; a polyethylene glycol dendrimer with one or more primary or secondary amino, carboxyl and/or thiol groups; or a copolymer which is a polymerization product of a composition comprising (1) about 60% or less by weight of one or more reactive vinylic monomers and (2) one or more non-reactive hydrophilic vinylic monomers, wherein said one or more reactive vinylic monomers are vinylic monomers having a carboxyl group, a primary amino group, or a secondary amino group, wherein said one or more non-reactive vinylic monomers are selected from the group consisting of a phosphorylcholine-containing vinylic monomer, (meth)acrylamide, N,N-dimethyl (meth)acrylamide, N-vinylpyrrolidone (NVP), N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, N,N-dimethylaminoethyl (meth)acrylate, N,N-dimethylaminopropyl (meth)acrylamide, glycerol (meth)acrylate, N-2-hydroxyethyl (meth)acrylamide, N,N-bis(hydroxyethyl) (meth)acrylamide, N-3-hydroxypropyl (meth)acrylamide, N-2-hydroxypropyl (meth)acrylamide, N-2,3-dihydroxypropyl (meth)acrylamide, *N*-tris(hydroxymethyl)methyl (meth)acrylamide, N-methyl-3-methylene-2-pyrrolidone, 1-ethyl-3-methylene-2-pyrrolidone, 1-methyl-5-methylene-2-pyrrolidone, 1-ethyl-5-methylene-2-pyrrolidone, 5-methyl-3-methylene-2-pyrrolidone, 5-ethyl-3-methylene-2-pyrrolidone, 2-hydroxyethyl (meth)acrylate, hydroxypropyl (meth)acrylate, C₁-C₄-alkoxy polyethylene glycol (meth)acrylate having a weight average molecular weight of up to 1500 Daltons, allyl alcohol, vinyl alcohol, and combinations thereof.
9. A soft contact lens, comprising: a silicone hydrogel lens body which is essentially made of a silicone hydrogel material; and a composite coating thereon, wherein the composite coating comprises a plasma base coating substantially free of (preferably free of) cracks, an anchor layer of poly(alkylacrylic acid) on top of the plasma base coating, and a hydrogel layer which is covalently attached onto the anchor layer, wherein the plasma base coating has a thickness of from about 0.5 nm to about 40 nm, wherein the poly(alkylacrylic acid)polymer is a homopolymer or copolymer of methacrylic acid, ethyl acrylic acid or 2-(meth)acrylamidoglycolic acid, wherein the soft contact lens in a fully-hydrated state has a friction rating of about 2 or lower after 7 cycles of manual rubbing test and an oxygen permeability of at least about 40 barrers.
10. The soft contact lens of claim 9, wherein the silicone hydrogel material comprises: (i) repeating units of at least one polysiloxane vinylic monomer and/or at least one

polysiloxane vinylic crosslinker and (ii) at least one hydrophilic monomer selected from the group consisting of at least one hydrophilic N-vinyl amide monomer, at least one hydroxyl-containing acrylic monomer, at least one alkyl (meth)acrylamide, at least one methylene-containing ($=CH_2$) pyrrolidone monomer, at least one vinyl ether monomer, at least one allyl ether monomer, at least one C_1 - C_4 alkoxyethoxy-containing monomer, at least one phosphorylcholine-containing vinylic monomer.

11. The soft contact lens of claim 9 or 10, wherein the silicone hydrogel material comprises:
 - (i) repeating units of at least one non-silicone vinylic crosslinker 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]tetrahydrofuran, 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, trimethylolpropane trimethacrylate, pentaerythritol tetramethacrylate, bisphenol A dimethacrylate, allylmethacrylate, allylacrylate, N-allyl-methacrylamide, N-allyl-acrylamide, and combinations thereof.
12. The soft contact lens of any one of claims 9 to 11, wherein the hydrogel layer is derived from a water-soluble polymeric material comprising reactive functional groups selected from the group consisting of azetidinium groups, carboxyl groups, primary amino groups, secondary amino groups, thiol groups, and combinations thereof.
13. The soft contact lens of any one of claims 9 to 12, wherein the water-soluble polymeric material comprises
 - (i) from about 20% to about 95% by weight of first polymer chains derived from a polyamidoamine-epichlorohydrin or a poly(2-oxazoline-co-ethyleneimine)-epichlorohydrin,
 - (ii) from about 5% to about 80% by weight of second polymer chains each derived from at least one second hydrophilicity-enhancing agent having at least one reactive functional group selected from the group consisting of primary amino group,

secondary amino group, carboxyl group, thiol group, and combinations thereof, wherein the second polymer chains are covalently attached to the first polymer chains through one or more covalent linkages each formed between one azetidinium group and one primary amino, secondary amino, carboxyl or thiol group, and

(iii) azetidinium groups which are parts of the first polymer chains or pendant or terminal groups covalently attached to the first polymer chains.

14. The soft contact lens of claim 13, wherein the second hydrophilicity-enhancing agent is: a polyethylene glycol having one sole primary or secondary amino, carboxyl or thiol group; a polyethylene glycol with two terminal primary or secondary amino, carboxyl and/or thiol groups; a multi-arm polyethylene glycol with one or more primary or secondary amino, carboxyl and/or thiol groups; a polyethylene glycol dendrimer with one or more primary or secondary amino, carboxyl and/or thiol groups; or a copolymer which is a polymerization product of a composition comprising (1) about 60% or less by weight of one or more reactive vinylic monomers and (2) one or more non-reactive hydrophilic vinylic monomers, wherein said one or more reactive vinylic monomers are vinylic monomers having a carboxyl group, a primary amino group, or a secondary amino group, wherein said one or more non-reactive vinylic monomers are selected from the group consisting of a phosphorylcholine-containing vinylic monomer, (meth)acrylamide, N,N-dimethyl (meth)acrylamide, N-vinylpyrrolidone (NVP), N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, N,N-dimethylaminoethyl (meth)acrylate, N,N-dimethylaminopropyl (meth)acrylamide, glycerol (meth)acrylate, N-2-hydroxyethyl (meth)acrylamide, N,N-bis(hydroxyethyl) (meth)acrylamide, N-3-hydroxypropyl (meth)acrylamide, N-2-hydroxypropyl (meth)acrylamide, N-2,3-dihydroxypropyl (meth)acrylamide, N-tris(hydroxymethyl)methyl (meth)acrylamide, N-methyl-3-methylene-2-pyrrolidone, 1-ethyl-3-methylene-2-pyrrolidone, 1-methyl-5-methylene-2-pyrrolidone, 1-ethyl-5-methylene-2-pyrrolidone, 5-methyl-3-methylene-2-pyrrolidone, 5-ethyl-3-methylene-2-pyrrolidone, 2-hydroxyethyl (meth)acrylate, hydroxypropyl (meth)acrylate, C₁-C₄-alkoxy polyethylene glycol (meth)acrylate having a weight average molecular weight of up to 1500 Daltons, allyl alcohol, vinyl alcohol, and combinations thereof.
15. The soft contact lens of any one of claims 9 to 14, wherein the soft contact lens in a fully-hydrated state further has: a WBUT of at least about 10 seconds; a water contact angle of about 80 degrees or less; an elastic modulus of about 1.5 MPa or less; a water content of from about 15% to about 70% when fully hydrated; or combinations thereof.