

What is claimed is:

1. A method of applying a hydrophilic coating onto a silicone hydrogel contact lens, comprising the steps of:
dipping a contact lens, successively but not in particular order, a coating solution containing a coating material and optionally hydrogen peroxide, water, and a ferrous ion solution containing ferrous ions and optionally hydrogen peroxide, wherein the coating material is at least one member selected from the group consisting of a hydrophilic vinylic monomer, a poly(C₁-C₃ hydroxyalkyl(meth)acrylate) homopolymer, a copolymer of C₁-C₃ hydroxyalkyl(meth)acrylate with at least one vinylic monomer, a poly(C₁-C₅ hydroxyalkyl(meth)acrylamide) homopolymer, a copolymer of C₁-C₅ hydroxyalkyl(meth)acrylamide with at least one vinylic monomer, an acrylated polysaccharide, a methacrylated polysaccharide, 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, a homopolymer of methacrylamide, a copolymer of acrylamide with one or more hydrophilic vinylic monomers, a copolymer of methacrylamide with one or more hydrophilic vinylic monomers, polyethylene oxide, a polyoxyethylene derivative, poly-N,N-dimethylacrylamide, poly(2-ethyl oxazoline), heparin polysaccharides, polysaccharides, polyvinyl alcohols (PVAs), polyamides, polyimides, polylactone, and combination thereof, wherein the coating material is grafted onto the surface of the contact lens by hydroxyl radicals generated in Fenton reaction without UV irradiation to form the hydrophilic coating.
2. The method of claim 1, wherein the coating material is a polyvinylpyrrolidone or a copolymer of N-vinylpyrrolidone with one or more vinylic monomer.
3. The method of claim 1, wherein the coating material is a hydrophilic vinylic monomer selected from the group consisting of N,N-dimethylacrylamide, N,N-dimethylmethacrylamide, 2-acrylamidoglycolic acid, 3-acryloylamino-1-propanol, N-hydroxyethyl acrylamide, N-[tris(hydroxymethyl)methyl]-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, 1-n-propyl-3-methylene-2-pyrrolidone, 1-n-propyl-5-methylene-2-pyrrolidone, 1-isopropyl-3-methylene-2-pyrrolidone, 1-isopropyl-5-methylene-2-pyrrolidone, 1-n-butyl-3-methylene-2-pyrrolidone, 1-tert-butyl-3-methylene-2-pyrrolidone, 2-hydroxyethylmethacrylate, 2-hydroxyethyl acrylate, hydroxypropyl acrylate, hydroxypropyl methacrylate, trimethylammonium 2-hydroxypropylmethacrylate hydrochloride, aminopropyl methacrylate hydrochloride, dimethylaminoethyl methacrylate, glycerol methacrylate, N-vinyl-2-pyrrolidone, allyl

alcohol, vinylpyridine, a C₁-C₄-alkoxy polyethylene glycol (meth)acrylate having a weight average molecular weight of up to 1500, N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, allyl alcohol, N-vinyl caprolactam, and mixtures thereof.

4. The method of claim 1, wherein the contact lens is Sn²⁺-pretreated by contacting the contact lens with a Sn²⁺ solution
5. The method of claim 1, 2, 3 or 4, wherein the contact is first dipped in the order of: (1) in the coating solution containing the coating material; (2) in water; and in a ferrous ion solution containing ferrous ions and hydrogen peroxide.
6. The method of claim 1, 2, 3 or 4, wherein the contact is first dipped in the order of: (1) in a ferrous ion solution containing ferrous ions and hydrogen peroxide; (2) in water; and in a coating solution containing a coating material.
7. The method of claim 1, 2, 3 or 4, wherein the contact is first dipped in the order of: (1) in a ferrous ion solution containing ferrous ions and hydrogen peroxide; (2) in water; and in a coating solution containing a coating material.
8. The method of claim 1, 2, 3 or 4, wherein the contact is first dipped in the order of: (1) in a ferrous ion solution containing ferrous ions and no hydrogen peroxide; (2) in water; and in a coating solution containing a coating material and hydrogen peroxide.
9. The method of claim 1, 2, 3 or 4, wherein the ferrous ion solution and/or the coating solution comprises Sn²⁺ ions.
10. The method of claim 1, 2, 3 or 4, wherein the contact lens is pretreated with a polyanionic polymer to form a layer of the polyanionic polymer on the contact lens, and subsequently dipped in the order of: (1) in a ferrous solution without hydrogen peroxide; (2) in water; and (3) in a coating solution containing hydrogen peroxide.
11. The method of claim 1, wherein the contact is first dipped in the order of: (1) in a coating solution containing a vinylic monomer including a carboxylic acid or sulphonic acid group; (2) in a ferrous ion solution containing ferrous ions and no hydrogen peroxide; (3) in water; and (4) in a solution containing hydrogen peroxide.
12. The method according to any one of claims 1-11, wherein the ferrous ion solution and/or the coating solution comprises Sn²⁺ ions.
13. The method according to any one of claims 1-12, further comprising the steps of: packaging the contact lens with the hydrophilic coating in a lens container containing a packaging solution including a wetting agent or a viscosity-enhancing agent; sealing the container; and autoclaving the container with the contact lens at a temperature of from 115 to 125°C for a time period of from about 15 minutes to about 90 minutes.
14. A silicone hydrogel contact lens obtained according to any one of claims 1-13.

15. The silicone hydrogel contact lens of claim 14, wherein the contact lens has at least one of property selected from the group consisting of an oxygen permeability of preferably at least about 40 barrers, a center thickness of about 30 to about 200 microns, an elastic modulus of about 2.0 MPa or less, an Ionoflux Diffusion Coefficient, D, of at least about 1.5×10^{-6} mm²/min, and a water content of preferably from about 15% to about 70%.

What is claimed is:

1. A method of applying a hydrophilic coating onto a silicone hydrogel contact lens, comprising the steps of graft polymerizing or graft crosslinking of a coating material onto the surface of the silicone hydrogel contact lens according to Fenton Chemistry in which hydroxyl radicals OH. and OOH. are generated from hydrogen peroxide in the presence of ferrous ions and used in initiating the graft polymerizing or graft crosslinking of the coating material,

wherein the coating material is at least one member selected from the group consisting of a hydrophilic vinylic monomer, a poly(C₁-C₃ hydroxyalkyl(meth)acrylate) homopolymer, a copolymer of C₁-C₃ hydroxyalkyl(meth)acrylate with at least one vinylic monomer, a poly(C₁-C₅ hydroxyalkyl(meth)acrylamide) homopolymer, a copolymer of C₁-C₅ hydroxyalkyl(meth)acrylamide with at least one vinylic monomer, an acrylated polysaccharide, a methacrylated polysaccharide, 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, a homopolymer of methacrylamide, a copolymer of acrylamide with one or more hydrophilic vinylic monomers, a copolymer of methacrylamide with one or more hydrophilic vinylic monomers, polyethylene oxide, a polyoxyethylene derivative, poly-N—N-dimethylacrylamide, poly(2-ethyl oxazoline), heparin polysaccharides, polysaccharides, polyvinyl alcohols (PVAs), polyamides, polyimides, polylactone, and combination thereof, wherein the coating material is covalently attached onto the surface of the contact lens without UV irradiation to form the hydrophilic coating.

2. The method of claim 1, wherein the coating material is a polyvinylpyrrolidone or a copolymer of N-vinylpyrrolidone with one or more vinylic monomer.

3. The method of claim 1, wherein the coating material is a hydrophilic vinylic monomer selected from the group consisting of N,N-dimethylacrylamide, N,N-dimethylmethacrylamide, 2-acrylamidoglycolic acid, 3-acryloylamino-1-propanol, N-hydroxyethyl acrylamide, N-[tris(hydroxymethyl)methyl]-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, 1-n-propyl-3-methylene-2-pyrrolidone, 1-n-propyl-5-methylene-2-pyrrolidone, 1-isopropyl-3-methylene-2-pyrrolidone, 1-isopropyl-5-methylene-2-pyrrolidone, 1-n-butyl-3-methylene-2-pyrrolidone, 1-tert-butyl-3-methylene-2-pyrrolidone, 2-hydroxyethylmethacrylate, 2-hydroxyethyl acrylate, hydroxypropyl acrylate, hydroxypropyl methacrylate, trimethylammonium 2-hydroxy propylmethacrylate hydrochloride, aminopropyl methacrylate hydrochloride, dimethylaminoethyl methacrylate, glycerol methacrylate, N-vinyl-2-pyrrolidone, allyl alcohol, vinylpyridine, a C₁-C₄-alkoxy polyethylene glycol (meth)acrylate having a weight average molecular weight of up to 1500, N-vinyl formamide, N-vinyl acetamide, N-vinyl isopropylamide, N-vinyl-N-methyl acetamide, allyl alcohol, N-vinyl caprolactam, and mixtures thereof.

4. The method of claim 1, wherein the contact lens is Sn²⁺-pretreated by contacting the contact lens with a Sn²⁺ solution.

5. The method of claim 1, wherein the contact lens is dipped in the order of: (1) in the coating solution containing the coating material; (2) in water; and (3) in a ferrous ion solution containing ferrous ions and hydrogen peroxide.

6. The method of claim 1, wherein the contact lens is dipped in the order of: (1) in a ferrous ion solution containing

ferrous ions and hydrogen peroxide; (2) in water; and in a coating solution containing the coating material.

7. The method of claim 6, wherein the ferrous ion solution and/or the coating solution comprises Sn^{2+} ions.

8. The method of claim 1, wherein the contact lens is dipped in the order of: (1) in a ferrous ion solution containing ferrous ions and hydrogen peroxide; (2) in water; and in a coating solution containing the coating material.

9. The method of claim 8, wherein the ferrous ion solution and/or the coating solution comprises Sn^{2+} ions.

10. The method of claim 1, wherein the contact lens is dipped in the order of: (1) in a ferrous ion solution containing ferrous ions and no hydrogen peroxide; (2) in water; and in a coating solution containing the coating material and hydrogen peroxide.

11. The method of claim 10, wherein the ferrous ion solution and/or the coating solution comprises Sn^{2+} ions.

12. The method of claim 5, wherein the ferrous ion solution and/or the coating solution comprises Sn^{2+} ions.

13. The method of claim 1, wherein the contact lens is pretreated with a polyanionic polymer to form a layer of the polyanionic polymer on the contact lens, and subsequently dipped in the order of: (1) in a ferrous solution without hydrogen peroxide; (2) in water; and (3) in a coating solution containing hydrogen peroxide and the coating material.

14. The method of claim 10, wherein the ferrous ion solution and/or the coating solution comprises Sn^{2+} ions.

15. The method of claim 1, wherein the contact lens is dipped in the order of: (1) in a coating solution containing the coating material which is a vinylic monomer including a carboxylic acid or sulphonic acid group; (2) in a ferrous ion solution containing ferrous ions and no hydrogen peroxide; (3) in water; and (4) in a solution containing hydrogen peroxide.

16. The method according to claim 15, wherein the ferrous ion solution and/or the coating solution comprises Sn^{2+} ions.

17. A silicone hydrogel contact lens obtained according to claim 1.

18. The silicone hydrogel contact lens of claim 17, wherein the contact lens has at least one of property selected from the group consisting of an oxygen permeability of at least about 40 barrers, a center thickness of about 30 to about 200 microns, an elastic modulus of about 2.0 MPa or less, an onoflux Diffusion Coefficient, D , of at least about 1.5×10^{-6} mm²/min, and a water content of from about 15% to about 70%.