Claims

1. A mold assembly for the manufacture of at least one ophthalmic lens, in particular a contact lens, which mold assembly comprises a mateable pair of mold parts made from glass or quartz wherein at least one of the cavity surfaces of the mold parts comprises a coating of an inorganic material to protect the mold parts from attack by monomer or prepolymer used in making the ophthalmic lens, which protective coating is externally applied and permanently affixed to the cavity surfaces of the mold assembly.

2. The mold assembly of claim 1, wherein the at least one of the cavity surfaces of the mold parts is the cavity surface of the female mold part.

3. The mold assembly of claim 1, wherein the mold part with the coated cavity surface is made from glass.

4. The mold assembly of claim 1, wherein the protective coating is uniform and continuous.

5. The mold assembly of claim 1, wherein the protective coating has a thickness from 10 nm to 1 µm, preferably from 15 nm to 100 nm and most preferably from 20 nm to 50 nm.

6. The mold assembly of claim 1, wherein the protective coating provides for a water dynamic contact angle of from 60° to 100°, preferably from 75° to 85°, most preferably around 80°.

7. The mold assembly of claim 1, wherein the protective coating comprises silicon oxide (SiO_2) in an amount from at least 20 at% (Si), preferably at least 25 at% (Si), most preferably at least 30 at% (Si).

8. A process for the manufacture of a molding, comprising the steps:
(a) permanently affixing a protective coating of an inorganic material to at least one of the cavity surfaces of a quartz or glass mold assembly;
(b) introducing an aqueous solution comprising a water soluble prepolymer having crosslinkable groups into the mold;
(e) initiating of crosslinking by irradiation with UV-light;
(f) releasing the molding from the mold, and
(g) washing and drying the mold.

9. A process for the manufacture of a molding, comprising the steps:
(a) permanently affixing a protective coating of an inorganic material to at least one of the cavity surfaces of a quartz or glass mold assembly;
(b) printing on the at least one coated surface of the quartz or glass mold;
(c) optionally curing the print by irradiation with UV-light;
(d) introducing an aqueous solution comprising a water soluble prepolymer having crosslinkable groups into the mold;
(e) initiating of crosslinking by irradiation with UV-light;
(f) releasing the molding from the mold, and
(g) washing and drying the mold.

10. The process for the manufacture of a molding according to claim 8 or 9, wherein the permanently affixing (a) is a process comprising the following steps:
- providing a silicone pad;
- contacting the silicone pad with the cavity surface of the mold half to be coated for a time from 1 to 10 days, preferably 24 to 72 h, with a defined pressure from 1 to 5 bar, preferably 1,5 to 3 bar, more preferably 1,6 to 2,4 bar;
- curing the coating by irradiation with UV light.

11. The process for the manufacture of a molding according to claim 10, wherein the silicone pad is made from polydimethylsiloxane.

12. The process for the manufacture of a molding according to claim 8 or 9, wherein the permanently affixing (a) is a two step plasma treatment comprising the following steps:
- treating the at least one of the cavity surfaces of a quartz or glass mold assembly with an oxygen plasma; and
- treating the at least one of the cavity surfaces of a quartz or glass mold assembly with a silane monomer plasma.

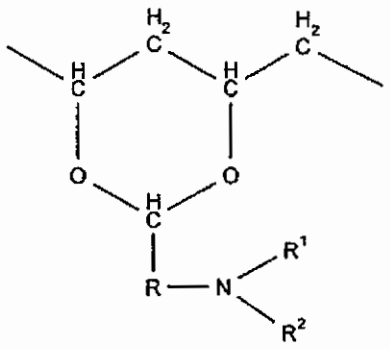
13. The process for the manufacture of a molding according to claim 12, wherein the silane monomer plasma is a mixed oxygen / tetramethylsilane plasma.

14. The process for the manufacture of a molding according to claim 9, comprising the steps:
(a) applying to at least one surface of a quartz or glass mold assembly a uniform and continuous protective coating using a two step plasma treatment;
(b) printing on the at least one coated surface of the quartz or glass mold using pad transfer printing;
(c) optionally curing the print by irradiation with UV-light;
(d) introducing an aqueous solution comprising a water soluble prepolymer having crosslinkable groups into the mold;
(e) initiating of crosslinking by irradiation with UV-light;
(f) releasing the molding form the mold, and
(g) washing and drying the mold.

15. The process for the manufacture of a molding according to one of claims 8 to 14, wherein the at least one of the cavity surfaces of the mold parts is the cavity surface of the female mold part made from glass.

16. The process for the manufacture of a molding according to one of claims 8 to 14, wherein the water soluble prepolymer having crosslinkable groups is a derivative of a polyvinyl alcohol having a molecular weight of at least 200 that, based on the number of

hydroxyl groups of the polyvinyl alcohol, comprises from approximately 0.5% to approximately 80% of units of formula

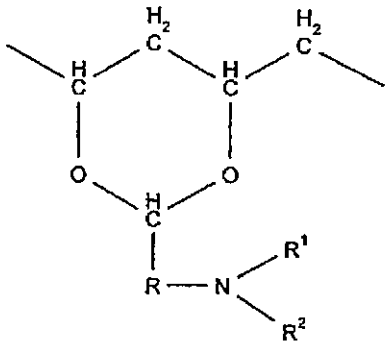


(V)

wherein R is C_1-C_8-alkylene, R^1 is hydrogen or C_1-C_4-alkyl and R^2 is an olefinically unsaturated, electron-attracting, copolymerizable radical, preferably having up to 25 carbon atom.

17. The process according to claim 16, wherein in the units of formula (V), R is methylene, R^1 is hydrogen and R^2 is acryloyl.

18. The process for the manufacture of a molding according to claim 14, wherein in the pad transfer printing a printing ink comprising from 80 to 98%, preferably 85 to 95%, most preferably 87 to 93% of a water soluble prepolymer having crosslinkable groups is used being a derivative of a polyvinyl alcohol having a molecular weight of at least 200 that, based on the number of hydroxyl groups of the polyvinyl alcohol, comprises from approximately 0.5% to approximately 80% of units of formula



(V)

wherein R is C_1-C_8-alkylene, R^1 is hydrogen or C_1-C_7-alkyl and R^2 is an olefinically unsaturated, electron-attracting, copolymerizable radical, preferably having up to 25 carbon atoms;

and wherein the printing ink is further comprising 2 to 20%, preferably 5 to 15%, most preferably 7 to 13% of a pigment or a combination of pigments.

19. The process according to claim 8 or 9, wherein the steps (b) to (g) are repeated in a cycle.

Claims

1. A process for the manufacture of an ophthalmic lens, comprising the steps:

   (a) permanently affixing a protective coating (3) of an inorganic material to at least one of the cavity surfaces (2) of a quartz or glass mold assembly;
   (b) printing on the at least one coated surface of the quartz or glass mold;
   (c) optionally curing the print by irradiation with UV-light;
   (d) introducing an aqueous solution comprising a water soluble prepolymer having crosslinkable groups into the mold;
   (e) initiating of crosslinking by irradiation with UV-light;
   (f) releasing the ophthalmic lens from the mold, and
   (g) washing and drying the mold.

2. The process of claim 1, wherein the permanently affixing (a) is a process comprising the following steps:

   - providing a silicone pad;
   - contacting the silicone pad with the cavity surface (2) of the mold half (1) to be coated for a time from 1 to 10 days, preferably 24 to 72 h, with a defined pressure from 1 to 5 bar, preferably 1,5 to 3 bar, more preferably 1,6 to 2,4 bar;
   - curing the coating by irradiation with UV light.

3. The process of claim 2, wherein the silicone pad is made from polydimethylsiloxane.

4. The process of claim 1, wherein the permanently affixing (a) is a two step plasma treatment comprising the following steps:

   - treating the at least one of the cavity surfaces (2) of a quartz or glass mold assembly with an oxygen plasma; and
   - treating the at least one of the cavity surfaces (2) of a quartz or glass mold assembly with a silane monomer plasma.

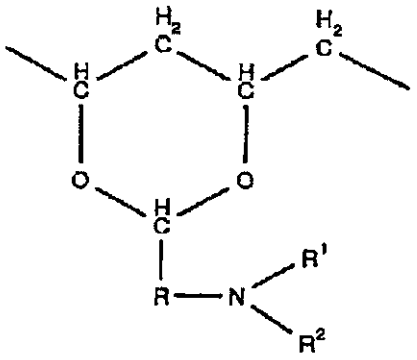
5. The process of claim 4, wherein the silane monomer plasma is a mixed oxygen / tetramethylsilane plasma.

6. The process of claim 1, comprising the steps:

   (a) applying to at least one surface of the quartz or glass mold assembly the uniform and continuous protective coating (3) using a two step plasma treatment;
   (b) printing on the at least one coated surface (2) of the quartz or glass mold using pad transfer printing;
   (c) optionally curing the print by irradiation with UV-light;
   (d) introducing the aqueous solution comprising a water soluble prepolymer having crosslinkable groups into the mold;
   (e) initiating of crosslinking by irradiation with UV-light;
   (f) releasing the ophthalmic lens form the mold, and
   (g) washing and drying the mold.

7. The process of any one of claims 1 to 6, wherein the at least one of the cavity surfaces (2) of the mold parts is the cavity surface of the female mold part made from glass.

8. The process of any one of claims 1 to 6, wherein the water soluble prepolymer having crosslinkable groups is a derivative of a polyvinyl alcohol having a molecular weight of at least 200 that, based on the number of hydroxyl groups of the polyvinyl alcohol, comprises from approximately 0.5% to approximately 80% of units of formula

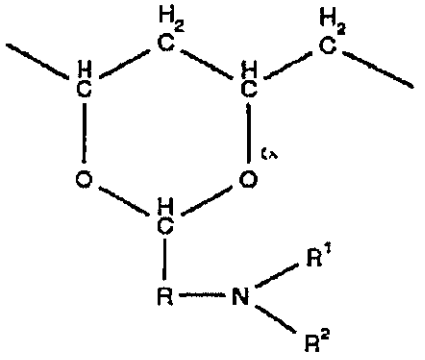


(V)

wherein R is C_1-C_8-alkylene, R^1 is hydrogen or C_1-C_7-alkyl and R^2 is an olefinically unsaturated, electron-attracting, copolymerizable radical, preferably having up to 25 carbon atom.

9. The process according to claim 8, wherein in the units of formula (V), R is methylene, R^1 is hydrogen and R^2 is acryloyl.

10. The process of claim 6, wherein in the pad transfer printing a printing ink comprising from 80 to 98%, preferably 85 to 95%, most preferably 87 to 93% of a water soluble prepolymer having crosslinkable groups is used being a derivative of a polyvinyl alcohol having a molecular weight of at least 200 that, based on the number of hydroxyl groups of the polyvinyl alcohol, comprises from approximately 0.5% to approximately 80% of units of formula



(V)

wherein R is C_1-C_8-alkylene, R^1 is hydrogen or C_1-C_7-alkyl and R^2 is an olefinically unsaturated, electron-attracting, copolymerizable radical, preferably having up to 25 carbon atoms;
and wherein the printing ink is further comprising 2 to 20%, preferably 5 to 15%, most preferably 7 to 13% of a pigment or a combination of pigments.

11. The process according to claim 1, wherein the steps (b) to (g) are repeated in a cycle.

12. The process according to claim 1, wherein the ophthalmic lens is a contact lens.