CLAIMS

1. A method for forming an Ophthalmic device insert comprising:

depositing Nanoscale metallic features on a substrate, wherein the Nanoscale metallic features have a surface area less then or approximately equal to 10,000 nm^2;

forming the substrate with Nanoscale metallic features into a three dimensional form; and

attaching the three dimensionally formed substrate within an insert.

2. A method for forming an Ophthalmic device utilizing the method according to claim 1 and additionally comprising:

placing the insert within a mold;
surrounding the insert with reactive mixture in the mold; and
polymerizing the reactive mixture.

3. The method according to claim 1 additionally comprising:

designing the shapes and sizes of Nanoscale metallic features, to be placed upon the substrate, on a computerized system comprising modeling software.

4. The method according to claim 3 additionally comprising:
placing the insert within a mold;
surrounding the insert with reactive mixture in the mold; and
polymerizing the reactive mixture to form an ophthalmic device.

5. The method according to claim 4 additionally comprising:

measuring the optical characteristics of the ophthalmic device.

6. The method according to claim 5 additionally comprising:
utilizing the results obtained from measuring to adjust the design process.

7. The method according to claim 6 wherein inputted parameters into the modeling system come from Ophthalmic measurements performed upon a patient.

8. The method according to claim 1 wherein:
the metallic features are arranged in a periodic pattern; and
the periodicity of the periodic pattern has a size scale less than or approximately equal to 700nm.

9. A method for forming an Ophthalmic insert device comprising:

depositing Nanoscale metallic features on a three dimensionally formed substrate, wherein the Nanoscale metallic features have a surface area less then or approximately equal to 10,000 nm^2;

attaching the three dimensionally formed substrate within an insert.

10. A method for forming an Ophthalmic insert device comprising:

depositing Nanoscale features on a substrate, wherein a portion of the features comprises a conductive electrode;

depositing a dielectric coating upon at least the portion of the feature comprising a conductive electrode;

treating the dielectric coating to establish a preference to a first fluid;

forming the substrate with Nanoscale features into a three dimensional form; and

attaching the three dimensionally formed substrate within an insert.

11. The method according to claim 10 additionally comprising:

filling regions of the substrate with a mixture of at least two immiscible fluids, wherein one of the immiscible fluids is a first fluid and any other fluids have the opposite wetting characteristic to the treated dielectric coating.

12. The method according to claim 11 wherein the first fluid includes metallic Nanoscale components.

13. The method according to claim 12 wherein the metallic Nanoscale components contain one or both of nanospheres and nanorods.

14. The method according to claim 13 wherein the surfaces of the metallic Nanoscale components are treated with surface bonded chemicals to establish a solvation preference to a first fluid.

15. The method according to claim 13 wherein the surfaces of the metallic Nanoscale components are treated with surface bonded chemicals to establish a solvation preference away from a first fluid.

16. The method of utilizing an Ophthalmic device fabricated according to the method of claim 10 comprising:

positioning the ophthalmic device between an eye surface and an eye lid.

17. The method according to claim 16 additionally comprising:

activating a function in the insert device with an activation signal, wherein the function corresponds to adjusting phase characteristics of incident light upon the insert device through interaction of light with Nanoscale Metasurface features.

18. The method according to claim 17 wherein:

the Nanoscale Metasurface features actively form within an insert by the application of electrical potential across electrodes within the insert thereby causing a corresponding wetting characteristic on the first fluid.

19. The method according to claim 18 additionally comprising:

visualizing an effect on an image observed by a user based up the activation of the Ophthalmic device.

20. The method according to claim 19 wherein:

the application of electrical potential occurs by an electrical circuit connecting an Electrowetting on Dielectric electrode to an energization element, wherein the energization element is comprised within the ophthalmic device.

Claims

1. A method for forming an ophthalmic device insert comprising:

depositing nanoscale metallic features onto a substrate, wherein the nanoscale metallic features have a surface area of less than or approximately equal to 10,000 nm^2;

forming the substrate with the nanoscale metallic features into a rigid three-dimensional form; and

attaching the rigid three-dimensionally formed substrate within the ophthalmic device insert.

2. A method for forming an ophthalmic device utilizing the method according to claim 1 and additionally comprising:

placing the ophthalmic device insert within a mold;

surrounding the ophthalmic device insert with reactive mixture in the mold; and

polymerizing the reactive mixture.

3. The method according to claim 1 additionally comprising:

designing the shapes and sizes of nanoscale metallic features on a computerized system comprising modeling software.

4. The method according to claim 3 additionally comprising:

placing the ophthalmic device insert within a mold;

surrounding the ophthalmic device insert with a reactive mixture in the mold; and polymerizing the reactive mixture to form an ophthalmic device.

5. The method according to claim 4 additionally comprising:

measuring optical characteristics of the ophthalmic device.

6. The method according to claim 5 additionally comprising:

utilizing results obtained from the measuring of the optical characteristics of the ophthalmic device to adjust a design process for the ophthalmic device insert.

7. The method according to claim 6 wherein parameters inputted into the modeling system come from ophthalmic measurements performed upon a patient.

8. The method according to claim 1 wherein:

the nanoscale metallic features are arranged in a periodic pattern, the periodic pattern having a periodicity of less than or approximately equal to 700 nm.

9. A method for forming an ophthalmic insert device comprising:

depositing nanoscale metallic features onto a rigid three-dimensionally formed substrate, wherein the nanoscale metallic features have a surface area of less than or approximately equal to 10,000 nm^2; and

attaching the rigid three-dimensionally formed substrate within the ophthalmic insert device.

10. A method for forming an ophthalmic insert device comprising:

depositing nanoscale metallic features onto a substrate, wherein a portion of the nanoscale features comprises a conductive electrode;

depositing a dielectric coating upon at least the portion of the nanoscale metallic features comprising the conductive electrode;

treating the dielectric coating to establish a preference to a first fluid;

forming the substrate with the nanoscale metallic features into a rigid three-dimensional form; and

attaching the three-dimensionally formed substrate within the ophthalmic insert device.

11. The method according to claim 10 additionally comprising:

filling regions of the substrate with a mixture of at least two immiscible fluids, wherein a first one of the immiscible fluids has a wetting characteristic to the treated dielectric coating that is opposite to the wetting characteristics of the other fluids in said mixture.

12. The method according to claim 11 wherein the first fluid includes the nanoscale metallic features.

13. The method according to claim 12 wherein the metallic nanoscale components contain one or both of nanospheres and nanorods.

14. The method according to claim 13 wherein the surfaces of the nanoscale metallic features are treated with surface bonded chemicals to establish a wetting preference to the first fluid.

15. The method according to claim 13 wherein the surfaces of the nanoscale metallic features are treated with surface bonded chemicals to establish a wetting preference to the second fluid.

16. The method of utilizing an ophthalmic device fabricated according to the method of claim 10 comprising:

positioning the ophthalmic device between an eye surface and an eyelid.

17. The method according to claim 16 additionally comprising:

activating a function in the ophthalmic insert device with an activation signal, wherein the function corresponds to adjusting phase characteristics of light incident upon the ophthalmic insert device through an interaction of the light with the nanoscale metallic features.

18. The method according to claim 17 wherein: the nanoscale metallic features actively form within the ophthalmic insert device by an application of electrical potential across electrodes within the ophthalmic insert device thereby causing a corresponding wetting characteristic on the first fluid.

19. The method according to claim 18 additionally comprising:

visualizing an effect on an image observed by a user based up the activation of the ophthalmic device.

20. The method according to claim 19 wherein: the application of electrical potential occurs by an electrical circuit connecting an electrowetting on dielectric electrode to an energization element, wherein the energization element is comprised within the ophthalmic device.