The present invention discloses a drug-carrying contact lens and a method for fabricating the same. The drug-carrying contact lens comprises a contact lens containing at least one amphiphatic hybrid nanocarrier carrying drug molecules. According to the heat or light sensitivity of the drug molecule, the present invention respectively fabricates an encapsulation-type drug-carrying contact lens and a drug-soaking type drug-carrying contact lens. The present invention uses a highly-biocompatible amphiphatic hybrid nanocarriers having superior drug encapsulation capability to wrap the drug molecules. Thereby, the drug molecules are uniformly distributed in the contact lens and can be gradually and locally released to the eye of the user wearing the contact lens. Therefore, the present invention can prevent or cure ocular diseases with the loss and side effects of the drug being reduced.
Fig. 1

- hydrophilic silanol group (Ⅱ)
- hydrophobic hexanoyl group (Ⅲ)
- main chain of chitosan (Ⅰ)
preparing a drug molecule solution

fully mixing amphiphatic hybrid nanocarriers and the drug molecule solution to form a first mixture solution

fully mixing the first mixture solution with a contact lens material to form a second mixture solution, and pouring the second mixture solution into a mold

light-curing the second mixture solution in the mold, and demolding the cured second mixture solution to obtain a drug-carrying contact lens

Fig. 2
fully mixing drug molecule solution, amphiphatic hybrid nanocarriers and a contact lens material the to form a third mixture solution

spraying the third mixture solution onto the surface of a contact lens to form a film

obtaining a drug-carrying contact lens

Fig. 3
preparing a solution of amphiphatic hybrid nanocarrier

fully mixing a contact lens material with the solution of amphiphatic hybrid nanocarriers to form a fourth mixture solution

pouring the fourth mixture solution into a mold, light-curing the fourth mixture solution in the mold, and demolding the cured fourth mixture solution to obtain a nanocarrier-containing contact lens

soaking the nanocarrier-containing contact lens in a drug molecule solution until concentration reaches a dynamic equilibrium to obtain a drug-carrying contact lens

Fig. 4
Fig. 5

Water Retention (%)

- silica-CHC (0.1%)
- silica-CHC (0.04%)
- silica-CHC (0.01%)
- only 2% MAA

Fig. 6

Cumulative AZM Release (%)

- 25°C
- 4°C
- 37°C

Time (Hr)

Time (hr)
Fig. 7(a)  

Cumulative Vit. B12 Release (ppm)  

- free CA  
- CA  

Time (hr)  

300 400 500 600 700 800

Fig. 7(b)  

Cumulative Vit. B12 Release (mg/mL)  

- B12 0.5 mg/ml  
- B12 5 mg/ml  

Time (hr)  

0 24 48
DRUG-CARRYING CONTACT LENS AND METHOD FOR FABRICATING THE SAME

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a drug eluting technology in contact lens, particularly to a drug-carrying contact lens that can release drugs locally for a long period of time and a method for fabricating the same.

[0003] 2. Description of the Related Art

[0004] Many people suffer from damaged or degenerating eyesight, such as myopia. Normally, the nearsighted wears glasses or contact lenses to obtain clear vision. For some people, the contact lens is a favorable option.

[0005] The contact lenses may be categorized into the rigid contact lens and the soft contact lens. The soft contact is normally made of silicone hydrogels, PAA (polyacrylamide), or PHEMA (poly 2-Hydroxy ethylmethacrylate). The soft contact lens is more comfortable and cheaper for the users and thus becomes the mainstream in the market. Although the material of the soft contact lens has been greatly improved, the irritation problem of wearing contact lenses still exists. The user wearing contact lenses usually feels eyes dry and irritable because humidity decreases in user’s eyes. Thus, the user has to apply a wetting agent to the contact lenses. When infected or irritated, eyes need some eyedrops or refreshing liquids. However, most of eyedrops or refreshing liquids are unlikely to apply to the eyes wearing contact lenses. In such a condition, the users should feel very inconvenient.

[0006] No matter whether the user wears contact lenses or not, the eyedrop, which has been dropped into eyes, would lose because of blinking, dilution, or rejection. Thus, the eyes can only absorb about 5% of the drug. Besides, the drug stays in eyes only for a short period of time. Once the drug enters the blood circulation, some side effects may occur.

[0007] Accordingly, the present invention proposes a drug-carrying contact lens and a method for fabricating the same to prevent or cure ocular diseases and overcome the abovementioned problems.

SUMMARY OF THE INVENTION

[0008] The primary objective of the present invention is to provide a drug-carrying contact lens and a method for fabricating the same, wherein a high biocompatibility nanocarrier having superior drug encapsulation capability is used to wrap drugs or absorb drug molecules from a drug solution and make the drugs uniformly distributed in a contact lens, whereby the contact lens can locally release the drugs to the eyes to prevent or cure ocular diseases.

[0009] Another objective of the present invention is to provide a drug-carrying contact lens and a method for fabricating the same, wherein the drug molecules carried by the contact lens can be gradually released to the tissue of the eye for a prolonged period of time (24 hours), whereby the minimum loss and side effects of the drug.

[0010] A further objective of the present invention is to provide a facile method for fabricating a drug-carrying contact lens.

[0011] To achieve the abovementioned objectives, the present invention proposes a drug-carrying contact lens, which comprises a contact lens containing at least one amphiphatic hybrid nanocarrier carrying drug molecules, whereby the drug molecules are encapsulated within the hybrid nanocarriers and uniformly distributed throughout the contact lens.

[0012] The amphiphatic hybrid nanocarrier is an amphiphatic organic-inorganic chitosan-silica hybrid nanocarrier.

[0013] In one embodiment, the method of the present invention comprises steps: adding amphiphatic hybrid nanocarriers to a drug solution, and agitating them into a uniform first mixture solution; fully mixing the first mixture solution with a contact lens material to form a second mixture solution, and pouring the second mixture solution into at least one mold; light-curing the second mixture solution in the mold, and demolding the cured second mixture solution to obtain a first encapsulation-type drug-carrying contact lens.

[0014] In another embodiment, the method of the present invention comprises steps: mixing a drug solution, an amphiphatic hybrid nanocarrier and a contact lens material, and agitating them into a uniform third mixture solution; spraying the third mixture solution onto the surface of a contact lens to form a film on the surface of contact lens, covered either all or part of the surface of a given contact lens; and obtain a second encapsulation-type drug-carrying contact lens.

[0015] In a further embodiment, the method of the present invention comprises steps: mixing an amphiphatic hybrid nanocarrier and a contact lens material, and agitating them into a uniform fourth mixture solution; pouring the fourth mixture solution into at least one mold, light-curing the fourth mixture solution, and demolding the cured fourth mixture solution to obtain a nanocarrier-containing contact lens; soaking the nanocarrier-containing contact lens in a drug solution until concentration reaches a dynamic equilibrium to obtain a drug-soaking type drug-carrying contact lens.

[0016] Below, the embodiments are described in detail in cooperation with the attached drawings to make easily understood the objectives, technical contents, characteristics and accomplishments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the Office upon request and payment of the necessary fee.

[0018] FIG. 1 schematically shows the structural formula of an amphiphatic organic-inorganic chitosan-silica hybrid nanocarrier and the self-assembly thereof according to one embodiment of the present invention;

[0019] FIG. 2 shows a flowchart of a method for fabricating a first encapsulation-type drug-carrying contact lens according to one embodiment of the present invention;

[0020] FIG. 3 shows a flowchart of a method for fabricating a second encapsulation-type drug-carrying contact lens according to one embodiment of the present invention;

[0021] FIG. 4 shows a flowchart of a method for fabricating a drug-soaking type drug-carrying contact lens according to one embodiment of the present invention;

[0022] FIG. 5 shows the test result of the water retentions of the drug-carrying contact lenses with respect to the quantities of the nanocarriers added to the contact lenses;

[0023] FIG. 6 shows the drug release test result of Azithromycin contained by the encapsulation-type drug-carrying contact lens with respect to the temperature;
FIG. 7(a) shows the drug release test result of Vitamin B12 respectively contained by the drug-carrying contact lens containing the drug carrier of the present invention and the drug-carrying contact lens free of drug carriers.

FIG. 7(b) shows the drug release test result of the drug-carrying contact lenses of the present invention respectively containing different concentrations of Vitamin B12.

FIG. 8(a) shows the SEM image of the amphipathic organic-inorganic chitosan-silica hybrid nanocarriers of the present invention, and

FIG. 8(b) shows the SEM image of the drug-carrying contact lens of the present invention. 

DETAILED DESCRIPTION OF THE INVENTION

The present invention pertains to a local drug delivery technology, wherein a contact lens releases a drug locally to prevent or cure ocular diseases. In the present invention, a high biocompatible nanocarrier having superior drug-encapsulation capability wraps and carries a drug, and uniformly distributed in a contact lens. The contact lens can gradually release the drug to the eye for a reasonably long period of time (>24 hours), whereby minimized the loss and side effects of the drug.

The drug-carrying contact lens of the present invention comprises a contact lens containing at least one amphiphatic nanocarrier. The amphipathic hybrid nanocarrier carries hydrophilic or hydrophobic drug molecules. The amphipathic hybrid nanocarriers and the drug molecules carried by the amphipathic hybrid nanocarriers are distributed throughout the contact lens or on the surface of the contact lens. The amphipathic hybrid nanocarrier is an optically transparent, in visible region, nanosphere having a diameter of 20-300 nm. The amphipathic hybrid nanocarriers have a concentration of 0.01-5 wt% in a contact lens fabricated. The drugs carried by the amphipathic hybrid nanocarriers included Vitamin A, Vitamin B12, Vitamin C, Vitamin E, azithromycin, fluorometholone facetate, bacitracin, neomycin, polyvinyl B sulfate, Oxytetracycline HCl, erythromycin, dexmethasone, prednisolone acetate, timolol maleate, or hydrocortisone.

In one embodiment, the amphipathic hybrid nanocarrier is an amphipathic organic-inorganic chitosan-silica hybrid nanocarrier. The chitosan used by the present invention is a biocompatible material and has been widely used in biomedical-related applications. The present invention modifies chitosan into an amphipathic organic-inorganic nanocarrier (silica-CHIC), which exhibits high biocompatibility and can self-assemble in aqueous solutions. The core-shell structure of the amphipathic hybrid nanocarrier functions as a physical barrier to regulate drug delivery and decreases drug loss caused by the swelling phenomenon of the polymeric molecules in an aqueous solution.

According to the light or heat sensitivity of the drug, the drug-carrying contact lenses of the present invention can be categorized into the encapsulation-type drug-carrying contact lens and the soaking-type drug-carrying contact lens. The drugs insensitive to light and heat may be used in the encapsulation-type drug-carrying contact lens. The drugs sensitive to light or heat may be used in the drug soaking-type drug-carrying contact lens. The encapsulation-type drug-carrying contact lenses may be further classified into the contact lenses wherein the drug molecules are directly mixed with the contact lens material, and the contact lenses wherein the drug molecules are sprayed onto the surface thereof to form a drug-containing film. No matter what type the drug-carrying contact lenses of the present invention belongs to, it can achieve the function of gradual and local drug delivery.

Below are described in detail the methods for fabricating various types of the drug-carrying contact lenses of the present invention. Before the methods are described is briefly introduced the amphipathic organic-inorganic chitosan-silica hybrid nanocarrier used by the present invention.

Refer to FIG. 1 showing the structural formula of the amphipathic organic-inorganic chitosan-silica hybrid nanocarrier and the self-assembly thereof. The backbone I of chitosan has carboxyl-modified hydrophilic terminals II and long carbon chain-modified hydrophobic terminals III, whereby the chitosan can self-assemble in an aqueous solution to form a hybrid nanoparticle having a core-shell structure. The method for fabricating the nanocarrier includes steps: dissolving 0.25 g of the amphipathic organic chitosan having carboxyl-modified hydrophilic terminals and long carbon chain-modified hydrophobic terminals in 50 ml of deionized water, and agitating them at an ambient temperature for 24 hours to form an amphipathic organic chitosan solution having a concentration of 0.5% wt%; gradually adding 160 μl of APTMS (or APTES) and 0.012 g of EDC to the amphipathic organic chitosan solution, and agitating them at an ambient temperature for 24 hours to form an organic-inorganic mixture solution, wherein APTMS and APTES respectively denote 3-aminopropyltrimethoxysilane and 3-aminopropyltriethoxysilane and both functions as coupling agents of inorganic silanyl groups, and wherein EDC denotes 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide and functions as a catalyst; using a dialysis membrane and a 75 v % alcohol solution to dialyse the organic-inorganic mixture solution for 24 hours, and then using dehydrated alcohol to dialyse the organic-inorganic mixture solution for 24 hours to obtain a dialysed product; drying the dialysed product with an oven to obtain the powder of the amphipathic organic-inorganic chitosan-silica hybrid nanocarriers (abbreviated as silica-CHIC thereinafter) shown in the drawing.

In one embodiment, the method for fabricating the contact lens material includes steps: uniformly mixing HEEMA (2-hydroxyethyl methacrylate) with 0.5-5 % MAA (methacrylate acid) to form a base material; uniformly mixing the HEEMA-MAA mixture solution with GDMA (ethylene glycol dimethacrylate) and AIBN (2,2’-Azobisobutyronitrile) to form a material of the drug-carrying contact lens in the present invention, wherein GDMA functions as a crosslinking agent and AIBN functions as a photosensitive initiator. The above-mentioned contact lens material is only an exemplification of the contact lens materials used in the present invention. Various contact lens materials available in the market may also be used to fabricate the drug-carrying contact lens according to the present invention.

Refer to FIG. 2 a flowchart of a method for fabricating a first encapsulation-type drug-carrying contact lens according to one embodiment of the present invention. In Step S10, dissolve drug molecules in a polar organic solvent, such as ethanol, PEG (Poly Ethylene Glycol), PPG (Poly Propylene Glycol), DMSO (dimethyl sulfoxide), THF (tetrahydrofuran), or an arbitrary combination thereof, and dilute the organic solution with deionized water to obtain a drug molecule solution having a given concentration. Next, in Step S12, add the silica-CHIC powder into the drug molecule solution, and agitate them at an ambient temperature for 24 hours to obtain a first mixture solution. Next, in Step S14, process
the first mixture solution centrifugally at a rotation speed of 8000 rpm for 20 minutes, take out the upper layer of the liquid to get the encapsulation rate, and take out the lower layer of the liquid, mix it with the contact lens material uniformly to form a second mixture solution, and pour the mixture solution into a mold. Next, in Step S16, cure the second mixture solution in the mold with ultraviolet light, demold the cured second mixture solution to obtain a semi-finished product, and flush the semi-product with a buffer solution to remove the unreacted monomers on the surface to obtain a first encapsulation-type drug-carrying contact lens.

[0036] Refer to FIG. 3 a flowchart of a method for fabricating a second encapsulation-type drug-carrying contact lens according to one embodiment of the present invention. In Step S20, mix uniformly the abovementioned drug molecule solution (the fabrication method thereof has been described hereinbefore and will not repeat here), the amphiphatic hybrid nanocarriers and the polymer of the contact lens material to form a third mixture solution. The polymer contains PHEMA (poly(2-hydroxyethyl methacrylate)) and PMAA (poly(methacrylate acid)) by a ratio of 100:0.5-5, such as the contact lens material mentioned above. Next, in Step S22, spray the third mixture solution onto an existing contact lens to form a film having a thickness of 0.5-10 μm. Thus, the film contains the amphiphatic hybrid nanocarriers carrying drug molecules as a second encapsulation-type drug-carrying contact lens in Step S24.

[0037] Refer to FIG. 4 a flowchart of a method for fabricating a drug-soaking type drug-carrying contact lens according to one embodiment of the present invention. In Step S30, add the silica-CHC powder into deionized water, and agitate them at an ambient temperature for 24 hours, and process them centrifugally at a rotation speed of 8000 rpm to obtain a solution of the amphiphatic hybrid nanocarriers. Next, in Step S32, take out the lower layer of the amphiphatic hybrid nanocarrier solution, and mix it with the abovementioned contact lens material uniformly to obtain a fourth mixture solution. Next, in Step S34, pour the fourth mixture solution into a mold, cure the fourth mixture solution in the mold with ultraviolet light, demold the cured fourth mixture solution to obtain a semi-finished product, and flush the semi-finished product with a buffer solution several times to remove the unreacted monomers to obtain a nanocarrier-containing contact lens. Next, in Step S36, dissolve the drug molecules in a polar organic solvent or deionized water to obtain a drug molecule solution, and soak the nanocarrier-containing contact lens in the drug molecule solution for 24 hours so that the concentration can reach a dynamic equilibrium, and take out the contact lens to obtain a drug-soaking type drug-carrying contact lens.

Water Retention Test

[0038] The water retentions of the drug-carrying contact lenses fabricated according to the abovementioned methods are tested with respect to the quantities of the nanocarriers added to the contact lenses. Firstly, dry the nanocarrier-containing contact lens in an oven, weigh the contact lens (Wd), and then soak the contact lens in physiological saline at an ambient temperature for 3 days to saturate the contact lens, dry the surface thereof, and weigh it again (Ww). Next, place the contact lens in an enclosed container, weigh the contact lens periodically (Ww), and obtain the water retention according to the equation: water retention (%) = 100% × (Ww−Wd) / (Ww−Wd). The test results are shown in FIG. 5. The MAA monomer is usually added to the ordinary contact lenses to increase the water retention. In addition to the MAA monomer, the drug carriers also play the same role in the present invention. From FIG. 5, it is known that the water retention of the contact lens containing silica-CHC is higher than that of the contact lens containing only MAA by 10-25% (24-72 h). Thus, it is because the chemical structure of the silica-CHC has many Si—OH groups, which can increase the hydrophilicity and water retention ability.

Drug-Release Test

[0039] The drug-release tests are respectively performed on the first encapsulation-type drug-carrying contact lens and the drug-soaking type contact lens of the present invention to understand the drug-release thereof.

[0040] In one embodiment, the encapsulation-type drug-carrying contact lens adopts a hydrophilic antibiotic—Azithromycin, which is an oral azolidine group antibiotic that is a subgroup of macrolides, and which is a broad-spectrum antibiotic effective to Gram-positive bacteria, Gram-negative bacteria, anaerobic bacteria, Chlamydia, helicoids, etc. The results of the drug-release tests are shown in FIG. 6. FIG. 6 shows that the release quantity of Azithromycin increases with the temperature. Such a phenomenon may be attributed to the fact: the higher the temperature, the higher the oscillation frequency of the drug molecules, and the greater the quantity of the drug molecules diffusing out. In the present invention, the drug-release amount can be quantitatively controlled according to the application environment. Therefore, the present invention has a potential to realize a customized drug-carrying contact lens.

[0041] In one embodiment, the drug-soaking type drug-carrying contact lens adopts Vitamin B12, which is a hydrophilic drug and effective to pernicious anemia, and which is a red crystalline powder likely to absorb humidity, easy to dissolve in water and alcohol, and slightly unstable in the environment of light, strong acid, and base. The results of the drug-release tests are shown in FIG. 7(a) and FIG. 7(b). FIG. 7(a) shows that the drug-carrying contact lens containing the drug carriers of the present invention releases the hydrophilic drug (Vitamin B12) more slowly than the drug-carrying contact lens free of drug carriers. Such a phenomenon is attributed: the porous core-shell structure (with pores of about 2-10 nm according to the BET analysis) of the drug carrier of the present invention effectively reduces the diffusion of the wrapped drug molecules, which is induced by the swelling of polymer in an aqueous solution. FIG. 7(b) shows that the drug-release rate increases with the concentration of the drug molecules. Such a phenomenon is attributed to the fact that the greater the concentration difference, the higher the driving force of drug molecule diffusion.

Image Analysis

[0042] The results of the SEM (Scanning Electron Microscopy) analysis are shown in FIG. 8(a) and FIG. 8(b). FIG. 8(a) shows that the amphiphatic organic-inorganic chitosan-silica hybrid nanocarriers of the present invention are self-assembled in water to form a particle having a diameter of about 100 nm. FIG. 8(b) shows that the amphiphatic organic-inorganic chitosan-silica hybrid nanocarriers are distributed in the drug-carrying contact lenses of the present invention.

[0043] In conclusion, the present invention uses a highly-biocompatible nanocarriers having superior drug encapsula-
tion capability to wrap the drug or absorb the drug molecules from the drug solution. Thereby, the drug molecules are uniformly distributed in the contact lens and can be gradually (>24 h) and locally released to the eye of the user wearing the contact lens of the present invention. Therefore, the present invention can prevent or cure ocular diseases with the loss and side effects of the drug being reduced. The present invention is easy to fabricate and thus has wide application.

[0044] The embodiments described above are to demonstrate the technical thoughts and characteristics of the present invention and enable the persons skilled in the art to understand, make and use the present invention. However, the embodiments described above are only to exemplify the present invention but not to limit the scope of the present invention. Any equivalent modification or variation according to the spirit of the present invention is to be also included within the scope of the present invention.

What is claimed is:

1. A drug-carrying contact lens comprising:
   a contact lens containing at least one amphiphatic hybrid nanocarrier carrying drug molecule.

2. The drug-carrying contact lens according to claim 1, wherein said amphiphatic hybrid nanocarrier is an amphiphatic organic-inorganic chitosan-silica hybrid nanocarrier.

3. The drug-carrying contact lens according to claim 2, wherein said amphiphatic hybrid nanocarriers and drug molecules carried thereby are distributed inside said contact lens or on a surface of said contact lens.

4. The drug-carrying contact lens according to claim 3 further comprising a polymeric material, wherein said polymeric material is mixed with said amphiphatic hybrid nanocarriers and said drug molecules to form a mixture solution, and wherein said mixture solution is sprayed onto said surface of said contact lens to form a film.

5. The drug-carrying contact lens according to claim 4, wherein said polymeric material contains PHEMA ((poly 2-Hydroxy ethylmethacrylate)) and PMAA (poly(methacrylate)) by a ratio of 100:5.5-5.

6. The drug-carrying contact lens according to claim 1, wherein said amphiphatic hybrid nanocarrier is an optically transparent nanosphere having a diameter of 20-300 nm.

7. The drug-carrying contact lens according to claim 1, wherein said amphiphatic hybrid nanocarriers has a concentration of 0.01-5 wt %.

8. The drug-carrying contact lens according to claim 1, wherein said drug molecule is a hydrophilic or hydrophobic drug molecule.

9. The drug-carrying contact lens according to claim 1, wherein said drug molecule is selected from a group consisting of Vitamin A, Vitamin B12, Vitamin C, Vitamin E, azithromycin, florometholone facetate, bacitracin, neomycin, polymyxin B sulfate, oxytetracycline HCl, erythromycin, dexamethasone, prednisolone acetate, timolol maleate, and hydrocortisone.

10. A method for fabricating a drug-carrying contact lens, comprising steps:
   fully mixing said first mixture solution and a contact lens material to form a second mixture solution, and pouring said second mixture solution into at least one mold; and
   curing said second mixture solution in said mold with light, and
eating said second mixture solution cured with light to obtain at least one drug-carrying contact lens.

11. The method for fabricating a drug-carrying contact lens according to claim 10, wherein fabricating said drug molecule solution further comprising steps:
   fully mixing drug molecules with a polar organic solvent to form a first solution; and
   diluting said first solution with deionized water to a given concentration to obtain said drug molecule solution.

12. The method for fabricating a drug-carrying contact lens according to claim 11, wherein said polar organic solvent is selected from a group consisting of ethanol, PEG (Poly Ethylene Glycol), PPG (Poly Propylene Glycol), DMSO (dimethyl sulfoxide), THF (tetrahydrofuran), and an arbitrary combination thereof.

13. The method for fabricating a drug-carrying contact lens according to claim 11, wherein said drug molecule is selected from a group consisting of Vitamin A, Vitamin B12, Vitamin C, Vitamin E, azithromycin, florometholone facetate, bacitracin, neomycin, polymyxin B sulfate, oxytetracycline HCl, erythromycin, dexamethasone, prednisolone acetate, timolol maleate, and hydrocortisone.

14. The method for fabricating a drug-carrying contact lens according to claim 10 further comprising a step:
   flushing said drug-carrying contact lens with a buffer solution.

15. The method for fabricating a drug-carrying contact lens according to claim 10, wherein said amphiphatic hybrid nanocarrier is an amphiphatic organic-inorganic chitosan-silica hybrid nanocarrier.

16. The method for fabricating a drug-carrying contact lens according to claim 10, wherein said second mixture solution in said mold is cured with ultraviolet light.

17. A method for fabricating a drug-carrying contact lens, comprising steps:
   fully mixing a drug molecule solution, amphiphatic hybrid nanocarriers and a contact lens material to form a third mixture solution;
   spraying said mixture solution onto a contact lens to form a film on a surface of said contact lens; and
   obtain a drug-carrying contact lens.

18. The method for fabricating a drug-carrying contact lens according to claim 17, wherein fabricating said drug molecule solution further comprising steps:
   fully mixing drug molecules with a polar organic solvent to form a second solution; and
   diluting said second solution with deionized water to a given concentration to obtain said drug molecule solution.

19. The method for fabricating a drug-carrying contact lens according to claim 18, wherein said polar organic solvent is selected from a group consisting of ethanol, PEG (Poly Ethylene Glycol), PPG (Poly Propylene Glycol), DMSO (dimethyl sulfoxide), THF (tetrahydrofuran), and an arbitrary combination thereof.

20. The method for fabricating a drug-carrying contact lens according to claim 18, wherein said drug molecule is selected from a group consisting of Vitamin A, Vitamin B12, Vitamin C, Vitamin E, azithromycin, florometholone facetate, bacitracin, neomycin, polymyxin B sulfate, oxytetracycline HCl, erythromycin, dexamethasone, prednisolone acetate, timolol maleate, and hydrocortisone.
tracin, neomycin, polymyxin B sulfate, Oxytetracycline HCl, erythromycin, dexamethasone, prednisolone acetate, timolol maleate, and hydrocortisone.

21. The method for fabricating a drug-carrying contact lens according to claim 17 further comprising a step:
   flushing said drug-carrying contact lens with a buffer solution.

22. The method for fabricating a drug-carrying contact lens according to claim 17, wherein said amphiphatic hybrid nanocarrier is an amphiphatic organic-inorganic chitosan-silica hybrid nanocarrier.

23. A method for fabricating a drug-carrying contact lens, comprising steps:
   fully mixing amphiphatic hybrid nanocarriers and a contact lens material to form a mixture solution;
   pouring said mixture solution into at least one mold, curing said mixture solution in said mold with light, and demolding said mixture solution cured by light to obtain at least one nanocarrier-containing contact lens; and
   soaking said nanocarrier-containing contact lens in a drug molecule solution until concentration reaches a dynamic equilibrium to obtain a drug-carrying contact lens.

24. The method for fabricating a drug-carrying contact lens according to claim 23, wherein fabricating said drug molecule solution further comprising a step:
   dissolving drug molecules in a polar organic solvent or deionized water.

25. The method for fabricating a drug-carrying contact lens according to claim 24, wherein said polar organic solvent is selected from a group consisting of ethanol, PEG (Poly Ethylene Glycol), PPG (Poly Propylene Glycol), DMSO (dimethyl sulfoxide), THF (tetrahydrofuran), and an arbitrary combination thereof.

26. The method for fabricating a drug-carrying contact lens according to claim 24, wherein said drug molecule is selected from a group consisting of Vitamin A, Vitamin B12, Vitamin C, Vitamin E, azithromycin, fluorometholone acetate, bacitracin, neomycin, polymyxin B sulfate, Oxytetracycline HCl, erythromycin, dexamethasone, prednisolone acetate, timolol maleate, and hydrocortisone.

27. The method for fabricating a drug-carrying contact lens according to claim 23 further comprising a step:
   flushing said nanocarrier-containing contact lens with a buffer solution.

28. The method for fabricating a drug-carrying contact lens according to claim 23, wherein said amphiphatic hybrid nanocarrier is an amphiphatic organic-inorganic chitosan-silica hybrid nanocarrier.

29. The method for fabricating a drug-carrying contact lens according to claim 23, wherein said mixture solution in said mold is cured with ultraviolet light.

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