CLAIMS

1. A method for producing a liquid crystalline drug delivery system, the method comprising:
   forming a first solution containing a lipidic component and an alcohol, the first solution being maintained at a temperature of 40-55 ^{o}C;
   obtaining a second solution that includes a mucoadhesive hydrophilic polymer and a buffer, the second solution being aqueous and maintained at a temperature of 5-55 ^{o}C;
   mixing the first solution and the second solution to form a combined nano/micro-dispersion, the mixing accomplished by a high energy mixing process selected from sonication, high shear mixing, and a combination thereof;
   subjecting the combined nano/micro-dispersion to microfluidization at a temperature of -10 ^{o}C to room temperature to form a nano-dispersion; and
   incubating the nano-dispersion at 2-5 ^{o}C to form a liquid crystalline drug delivery system,
   wherein a weight ratio between the first solution and the second solution is 1:1 to 1:15, the lipidic component includes phosphatidylcholine and medium chain triglycerides, the alcohol is cetyl alcohol, and the mucoadhesive hydrophilic polymer is selected from the group consisting of sodium hyaluronate, xanthan gum, guar gum, carboxymethyl cellulose, 1-4 beta glucan, poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide), tamarind seed polysaccharide, sodium alginate, polycarbopol, polycarbophil, and a mixture thereof.

2. The method of claim 1, wherein the first solution further contains cholesterol, polyethylene glycol (PEG) 400, polypropylene glycol (PPG), PEG-stearate, poloxamer 407, tyloxapol, polysorbate 80, poly(lactic-co-glycolic acid), or castor oil.

3. The method of claim 1, further comprising dissolving at least one active pharmaceutical ingredient (API) into the first solution, wherein the at least one API is selected from the group consisting of fluticasone propionate, dexamethasone, betamethasone, budesonide, triamcinolone acetonide, methyl prednisolone, cortisone, beclometasone, fluticasone furoate, deoxycorticosterone acetate, loteprednol etabonate, difluprednate, fluorometholone, rimexolone, travoprost, azithromycin, moxifloxacin, netilmycin, nepafenac, diclofenac, difluprednate, posaconazole, prednisolone acetate, and a combination thereof.

4. A liquid crystalline drug delivery system, comprising nanoparticles dispersed in an aqueous solution, the nanoparticles including a lipidic component and an alcohol, the aqueous solution containing a mucoadhesive hydrophilic polymer and a buffer,
   wherein the lipidic component is present at 0.1-1% by weight of the system, the

alcohol is present at 0.1-5% by weight of the system, the mucoadhesive hydrophilic polymer is present at 1-5% by weight of the system, the nanoparticles have a size of 40 nm to 900 nm, the system has a pH of 6-7.5, an osmolarity of 250-340 mOsm/L, and a viscosity of 200-1000 cP, the lipidic component includes phosphatidylcholine and medium chain triglycerides, the alcohol is cetyl alcohol, and the mucoadhesive hydrophilic polymer is selected from the group consisting of sodium hyaluronate, xanthan gum, guar gum, carboxymethyl cellulose, 1-4 beta glucan, poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide), tamarind seed polysaccharide, sodium alginate, polycarbopol, and polycarbophil, and a mixture thereof .

5. The liquid crystalline drug delivery system of claim 4, wherein the nanoparticles further include cholesterol, polyethylene glycol (PEG) 400, polypropylene glycol (PPG), PEG-stearate, poloxamer 407, tyloxapol, polysorbate 80, castor oil, PEGylated castor oil, poly(lactic-co-glycolic acid), or mixtures thereof.

6. The liquid crystalline drug delivery system of claim 4, further comprising an active pharmaceutical ingredient (API) at 0.01-0.5% by weight of the system, wherein the API is loaded in the nanoparticles and the API is an anti-inflammatory, a peptide, an anti-oxidant, an antifungal, an anti-glaucoma drug, or a combination thereof.

7. The liquid crystalline drug delivery system of claim 4, further comprising an active pharmaceutical ingredient (API) at 0.01-0.5% by weight of the system, wherein the API is loaded in the nanoparticles and the API is selected from the group consisting of fluticasone propionate, dexamethasone, betamethasone, budesonide, triamcinolone acetonide, methyl prednisolone, cortisone, beclometasone, fluticasone furoate, deoxycorticosterone acetate, loteprednol etabonate, difluprednate, fluorometholone, rimexolone, travoprost, azithromycin, moxifloxacin, netilmycin, nepafenac, diclofenac, difluprednate, posaconazole, prednisolone acetate, and a mixture thereof.

8. A pharmaceutical composition for treating an ocular disorder, comprising the liquid crystalline drug delivery system of claim 6.

9. The pharmaceutical composition of claim 8, wherein the ocular disorder is post-operative inflammation, inflammation, allergic rhinitis, allergic conjunctivitis, meibomian gland dysfunction, infection, conjunctivitis, keratitis, ulcers, blepharitis, glaucoma, uveitis, diabetic macular edema, diabetic retinopathy, age-related macular degeneration, endophthalmitis, choroidal neovascularization, tear duct dysfunction, corneal blebs, or dry eye disease.

10. The pharmaceutical composition of claim 8, wherein the liquid crystalline drug delivery system is administered by vitreous injection, by spraying into the eye, or as an eye-drop.

11. The pharmaceutical composition of claim 9, wherein the ocular disorder is blepharitis and the API is fluticasone propionate.

12. The pharmaceutical composition of claim 9, wherein the ocular disorder is allergic conjunctivitis and the API is loteprednol etabonate.

13. The pharmaceutical composition of claim 9, wherein the ocular disorder is post-operative inflammation and the API is dexamethasone.

14. The pharmaceutical composition of claim 9, wherein the ocular disorder is infection and the API is moxifloxacin.

15. The pharmaceutical composition of claim 9, wherein the ocular disorder is keratitis and the active pharmaceutical ingredient is an antifungal.

16. The pharmaceutical composition of claim 9, wherein the ocular disorder is uveitis.

17. The pharmaceutical composition of claim 9, wherein the ocular disorder is glaucoma.

18. The pharmaceutical composition of claim 9, wherein the ocular disorder is diabetic retinopathy.

19. The pharmaceutical composition of claim 9, wherein the ocular disorder is age-related macular degeneration.

20. The pharmaceutical composition of claim 9, wherein the ocular disorder is choroidal neovascularization.