CLAIMS

1. A method of preparing substantially lens-shaped cargo-loaded silica nanocapsules, the method comprising:

mixing a surfactant with water at a temperature that is above the gel-to-liquid transition temperature of the surfactant to form a mixture;

passing the mixture one or more times through at least one pore to obtain a dispersion of vesicles;

adding a silica precursor to the dispersion of vesicles to form substantially lens-shaped silica nanocapsules; and

loading one or more types of cargo molecules into the substantially lens-shaped silica nanocapsules at a loading capacity of at least 20% to obtain the substantially lens-shaped cargo-loaded silica particles,

wherein the one or more types of cargo molecules comprises a hydrophilic active molecule.

2. The method according to claim 1, wherein the step of adding a silica precursor to the dispersion of vesicles results in the silica precursor reacting with the vesicles to generate an organic solvent.

3. The method according to claim 2, wherein the organic solvent generated from the reaction between the silica precursor and the vesicles causes the shape of the vesicles to change from a substantially spherical shape to a substantially lens shape.

4. The method according to any one of claims 1-3, wherein the surfactant comprises a quaternary ammonium compound.

5. The method according to any one of claims 1-4, wherein the silica precursor comprises a silicon alkoxide.

6. The method according to any one of claims 1-5, wherein the surfactant comprises a quaternary ammonium compound selected from the group consisting of:
dimethyldioctadecylammonium bromide (DODAB); dimethyldioctadecylammonium chloride (DODAC); sulfate, phosphate or acetate salt of dimethyldioctadecylammonium (DODAX); dimethyldioctadecenylammonium bromide (DDAB); dimethyldioctadecenylammonium chloride (DDAC); sulfate, phosphate, acetate salt of dimethyldioctadecenylammonium (DDAX); bromide, chloride, sulfate, phosphate or acetate salt of 1,2-dioleoyl-3-trimethylammonium propane (DOTAP); bromide, chloride, sulfate, phosphate or acetate salt of 1,2-dioleoyl-3-dimethylammonium propane (DODAP); bromide, chloride, sulfate, phosphate or acetate salt of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethylammonium (DOTMA), and combinations thereof; and wherein the silica precursor comprises a silicon alkoxide selected from the group consisting of:
tetramethyl orthosilicate (TMOS), tetraethyl orthosilicate (TEOS),
tetrapropyl orthosilicate (TPOS), tetrabutyl ortho silicate (TBOS) and combinations thereof.

7. The method according to any one of claims 1-6, wherein the at least one pore has a size of from 100 nm to 1300 nm.

8. The method according to any one of claims 1-7, wherein the step of passing the mixture one or more times through at least one pore comprises passing the mixture at least four times through the at least one pore to reach a dispersion of vesicles having a bluish hue.

9. The method according to any one of claims 1-8, wherein the step of adding a silica precursor to the dispersion of vesicles to form substantially lens-shaped silica nanocapsules is carried out under ambient conditions.

10. The method according to any one of claims 1-9, wherein the step of adding a silica precursor comprises adding the silica precursor to the dispersion of vesicles in an amount such that the surfactant to silica precursor ratio is from 1:5 to 1:40.

11. The method according to any one of claims 1-10, further comprising non-thermally drying the substantially lens-shaped silica nanocapsules to obtain a powdered form of substantially lens-shaped silica nanocapsules.

12. The method according to any one of claims 1-11, wherein the step of loading one or more types of cargo molecules into the substantially lens-shaped silica nanocapsules comprises:

subjecting the substantially lens-shaped silica nanocapsules to a solution of the one or more types of cargo molecules; and

coagulating and/or filtrating the substantially lens-shaped silica nanocapsules-containing solution to obtain the substantially lens-shaped cargo-loaded silica nanocapsules.

13. The method according to any one of claims 1-11, wherein the step of loading one or more types of cargo molecules into the substantially lens-shaped silica nanocapsules comprises:

mixing the one or more types of cargo molecules with the substantially lens-shaped silica nanocapsules in the presence of a first organic solvent and a second organic solvent to obtain the substantially lens-shaped cargo-loaded silica nanocapsules,

wherein the one or more types of cargo molecules is miscible with the first organic solvent, wherein the one or more types of cargo molecules is not miscible with the second organic solvent and wherein the first and second organic solvents are miscible with each other.

14. The method according to claim 13, wherein the step of mixing comprises mixing the one or more types of cargo molecules with the substantially lens-shaped

nanocapsules in the presence of a first organic solvent prior to adding the second organic solvent.

15. The method according to any one of claims 1-14, wherein the method is substantially devoid of the addition of an organic solvent, the addition of a strong acid, the use of etching and the use of calcination, for the removal of a template used to form the substantially lens-shaped silica nanocapsules.

16. A substantially lens-shaped cargo-loaded silica nanocapsule formed from a vesicle template, the substantially lens-shaped cargo-loaded silica nanocapsule comprising:

a porous silica shell;

a substantially hollow core; and

one or more types of cargo molecules loaded in the substantially hollow core at a loading capacity of at least 20%,

wherein the one or more types of cargo molecules comprises a hydrophilic active molecule.

17. The substantially lens-shaped cargo-loaded silica nanocapsule according to claim 16, wherein the one or more types of cargo molecules are selected from the group consisting of therapeutic agents, diagnostic agents, pharmaceutical agents, cosmetic agents, cosmeceutical agents, nutraceutical agents and combinations thereof.

18. The substantially lens-shaped cargo-loaded silica nanocapsule according to any one of claims 16-17, wherein the substantially lens-shaped cargo-loaded silica nanocapsule has a silky feel to skin.

19. The substantially lens-shaped cargo-loaded silica nanocapsule according to any one of claims 16-18, wherein the substantially lens-shaped cargo-loaded silica nanocapsule comprises one or more of the following properties: biodegradable, biocompatible, non-toxic, hypoallergenic, non-immunogenic and more stable than a spherical microcapsule.