CLAIMS:

1. A vesicle in a liquid composition, the vesicle comprising an amphiphilic diblock copolymer of the poly(2-methyloxazoline)-block-poly(dimethyl siloxane) (PMOXA-PDMS) type as vesicle membrane forming material, an additive from about 0.05% to about 1% (v/v) based on the liquid composition, of reactive end group functionalised poly(dimethyl siloxane) (PDMS), and a transmembrane protein, wherein the reactive end group is one, two, or more of amine, carboxylic, and/or hydroxy group(s).
2. The vesicle according to claim 1, wherein said PMOXA-PDMS is selected from the group consisting of $PMOXA_{10-40}$-$PDMS_{25-70}$ and mixtures thereof.
3. The vesicle according to claim 2, wherein the mixture comprises at least a first amphiphilic diblock copolymer of the general formula $PMOXA_{10-28}$-$PDMS_{25-70}$ and a second amphiphilic diblock copolymer of the general formula $PMOXA_{28-40}$-$PDMS_{25-70}$.
4. The vesicle according to claim 3, wherein the weight proportion between the first and the second amphiphilic diblock copolymer is in the range of 0.1:1 to 1:0.1.
5. The vesicle according to any one of the claims 1 to 4, wherein the concentration of amphiphilic diblock copolymer in the liquid composition is in the range of 0.1 to 50 mg/ml, such as 0.5 to 20 mg/ml, and preferably 1 to 10 mg/ml.
6. The vesicle according to any one of claims 1 to 5, wherein said reactive end group functionalised PDMS is $PDMS_{30-50}$ functionalized with one or more of amine, carboxylic acid, and/or hydroxy group(s).
7. The vesicle according to any one of the claims 1 to 6, wherein the reactive end group functionalised PDMS is poly(dimethylsiloxane), bis(3-aminopropyl).
8. The vesicle according to any one of the claims 1 to 7, wherein the reactive end group functionalised PDMS is selected from the group consisting of H_2N-$PDMS_{30-50}$, HOOC-$PDMS_{30-50}$, and HO-$PDMS_{30-50}$ and mixtures thereof.
9. The vesicle according to any one of claims 1-8, wherein the transmembrane protein is an aquaporin water channel.
10. The vesicle according to claim 1 further comprising from about 1 % (v/v) to about 12 % (v/v) based on the liquid composition, of a triblock copolymer of the PMOXA-PDMS-PMOXA type.
11. The vesicle according to claim 10, wherein said triblock copolymer of the PMOXA-

PDMS-PMOXA type is selected from $PMOXA_{10-20}$-$PDMS_{25-70}$-$PMOXA_{10-20}$.

12. The vesicle according to any of the claims 1 to 11, wherein the liquid composition further comprises a flux improving agent.
13. The vesicle according to claim 12, wherein the flux improving agent is an alkylene glycol monoalkyl ether alkylat, beta cyclodextrin, or polyethylene glycol (15)-hydroxystearate.
14. The vesicle according to claim 13, wherein the flux increasing agent is present in an amount of 0.1% to 10% by weight of the liquid composition.
15. The vesicle according to any of the claim 1 to 14 being present in a liquid composition comprising a buffer.
16. The vesicle according to any of the claims 1 to 15, liquid composition further comprising a detergent or a surfactant.
17. The vesicle according to claim 16, wherein the detergent is selected from the group consisting of lauryldimethylamine N-oxide (LDAO), octyl glucoside (OG), dodecyl maltoside (DDM) or combinations thereof.
18. The vesicle according to any one of claims 1 to 17, wherein the transmembrane protein is an aquaporin water channel.
19. A method of preparing vesicles in a liquid composition incorporating a transmembrane protein comprising the step of stirring a mixture of a solution of an amphiphilic diblock copolymer of the poly(2-methyloxazoline)-block-poly(dimethyl siloxane) (PMOXA-PDMS) type, 0.05% to about 1% (v/v) based on the of liquid composition, of reactive end group functionalised poly(dimethyl siloxane) (PDMS), and a transmembrane protein, wherein the reactive end group is one, two, or more of amine, carboxylic, and/or hydroxy group(s).
20. The method according to claim19, wherein the stirring is continued for 12-16 hours.
21. The method according to claim 19 or 20, wherein said PMOXA-PDMS is selected from the group consisting of $PMOXA_{10-40}$-$PDMS_{25-70}$ and mixtures thereof.
22. The method according to claim 21, wherein mixture comprises at least a first amphiphilic diblock copolymer of the general formula $PMOXA_{10-28}$-$PDMS_{25-70}$ and a second amphiphilic diblock copolymer of the general formula $PMOXA_{28-40}$-$PDMS_{25-70}$.
23. The method according to claim 22, wherein the weight proportion between the first and the second amphiphilic diblock copolymer is in the range of 0.1:1 to 1:0.1.
24. The method according to any one of the claims 19 to 23, wherein the concentration of amphiphilic diblock copolymer in the liquid composition is in the range of 0.1 to 50 mg/ml,

such as 0.5 to 20 mg/ml, and preferably 1 to 10 mg/ml.

25. The method according to any one of claims 19 to 24, wherein said reactive end group functionalised PDMS is $PDMS_{30-50}$ is functionalized with one or more of amine, carboxylic acid, and/or hydroxy group(s).

26. The method according to any one of the claims 19 to 25, wherein the reactive end group functionalised PDMS is poly(dimethyl siloxane), bis(3-aminopropyl).

27. The method according to any one of the claims 19 to 26, wherein the reactive end group functionalised PDMS is selected from the group consisting of H_2N-$PDMS_{30-50}$, HOOC-$PDMS_{30-50}$, and HO-$PDMS_{30-50}$ and mixtures thereof as cross-linking agent.

28. The method according to any one of claims 19-27, wherein the transmembrane protein is an aquaporin water channel.

29. The method according to any one of the claims 19-28, further comprising from about 1 % (v/v) to about 12 % (v/v) based on the liquid composition, of triblock copolymer of the PMOXA-PDMS-PMOXA type.

30. The method according to claim 29, wher-ein the liquid composition comprises 2 to 10 % (v/v) of triblock copolymer of the PMOXA-PDMS-PMOXA type as an additive.

31. The method according to claims 29 or 30, wherein said triblock copolymer of the PMOXA-PDMS-PMOXA type is selected from $PMOXA_{10-20}$-$PDMS_{25-70}$-$PMOXA_{10-20}$.

32. The method according to any of the claims 19 to 31, further comprising a flux improving agent.

33. The method according to claim 32, wherein the flux improving agent is an alkylene glycol monoalkyl ether alkylat, beta cyclodextrin, or polyethylene glycol (15)-hydroxystearate.

34. The method according to any one of the claims 32 or 33, wherein the flux increasing agent is present in an amount of 0.1% to 10% by weight of the liquid composition.

35. The method according to any of the claim 19, further comprising a buffer in the liquid composition.

36. The method according to any of the claims 19 to 35, wherein the liquid composition further comprising a detergent or a surfactant.

37. The method according to claim 36, wherein the detergent is selected from the group consisting of lauryldimethylamine N-oxide (LDAO), octyl glucoside (OG), dodecyl maltoside (DDM) or combinations thereof.

38. The method according to any one of claims 19 to 37, wherein the transmembrane protein is an aquaporin water channel.

39. A separation membrane comprising a vesicle according to any one of claims 1-18.
40. The separation membrane according to claim 39, wherein the separation membrane comprises an active layer incorporating the vesicle and a porous support membrane.
41. The separation membrane according to anyone of claims 39 or 40, wherein the active layer comprises the vesicle incorporated in a thin film composite (TFC) layer formed on a porous substrate membrane.
42. The separation membrane according to claim 41, wherein the active layer incorporating the vesicle is formed by the layer-by-layer deposition method.
43. A method of preparing a thin film composite layer immobilizing vesicles incorporating a transmembrane protein on a porous substrate membrane, comprising the steps of
    a. Providing a mixture of vesicles in a liquid composition prepared in accordance with any of the claims 19 to 38 and a di-amine or tri-amine compound,
    b. Covering the surface of a porous support membrane with the mixture of step a,
    c. Applying a hydrophobic solution comprising an acyl halide compound, and
    d. Allowing the aqueous solution and the hydrophobic solution to perform an interfacial polymerization reaction to form the thin film composite layer.
44. The method according to claim 43, wherein the di-amine compound is 1,3-diaminobenzene.
45. The method according to claims 43 or 44, wherein the proportion by weight of the di-amine or tri-amine compound to acyl halide compound is from 0:1 to 30:1 by weight.
46. The method according to anyone of the claims 43 to 45, wherein the hydrophobic solution further comprises a TFC layer modifying agent in an amount of 0.1 to 10% by volume.
47. The method according to claim 46, wherein the TFC layer modifying agent is a C3 to C8 carbonyl compound.
48. The method according to anyone of claims 46 or 47, wherein the TFC layer modifying agent selected among the group consisting of diethylene ketone, 2-pentanone, 5-pentanone, cyclopentanone.
49. The method according to anyone of the claims 43 to 48, wherein the porous support membrane is formed by a polysulfone or a polyethersulfone polymer.
50. The method according to anyone of the claims 43 to 49, wherein the porous support membrane is a hollow fiber.
51. The method according to claim 50, comprising the further step of producing a hollow fiber module by assembling a bundle of hollow fibers in a housing, wherein an inlet for passing a first solution is connected to the lumen of the hollow fibers in one end and an outlet is connected to the lumen in the other end, and an inlet is provided in the housing for passing a second solution to an outlet connected to the housing.

52. The method according to anyone of the claims 43 to 49, wherein the porous support membrane is a flat sheet.

53. The method according to anyone of the claims 43 to 52, comprising the further step of producing a spiral wound membrane module by winding the flat sheet membrane.

54. The method according to any one of the claims 48 or 53, wherein the hollow fiber module or the spiral wound membrane module is used for preparing a pure water filtrate by reverse osmosis.

55. The method according to any of the claims 48 and 53, wherein the hollow fiber module or the spiral wound membrane module is used for the concentration of a product solution by forward osmosis.

56. The method according to any of the claims 48 and 53, wherein the hollow fiber module or the spiral wound membrane module is used for the production of salinity power using pressure retarded osmosis, said method comprising utilizing the separation membrane to increase hydrostatic pressure, and using the increase in hydrostatic pressure as a source of salinity power.