Claims

[Claim 1] A thin-film-composite hollow-fiber membrane comprising:

a phase-inversion layer in the form of a hollow fiber substrate; and

an active layer coated on the phase-inversion layer, wherein the active layer selectively allows passage of water molecules but rejects at least some dissolved ions,

wherein the thin-film-composite hollow-fiber membrane has an internal burst pressure of at least 4 MPa.

[Claim 2] The thin-film-composite hollow-fiber membrane of claim 1, wherein the phase-inversion layer is an outer layer and the active layer is an inner layer.

[Claim 3] The thin-film-composite hollow-fiber membrane of claim 1, wherein the phase-inversion layer is formed of at least one polymer selected from a polyethersulfone or a polysulfone.

[Claim 4] The thin-film-composite hollow-fiber membrane of claim 1, wherein the active layer is formed via an interfacial polymerization process.

[Claim 5] The thin-film-composite hollow-fiber membrane of claim 1, wherein the phase-inversion layer comprises a finger-like macrovoid region and a sponge-like region.

[Claim 6] The thin-film-composite hollow-fiber membrane of claim 5, wherein the phase-inversion layer has a wall thickness, the finger-like macrovoid region has a thickness, and the thickness of the finger-like macrovoid region is no greater than 70% of the wall thickness.

[Claim 7] The thin-film-composite hollow-fiber membrane of claim 1, wherein the internal burst pressure is at least 7 MPa.

[Claim 8] The thin-film-composite hollow-fiber membrane of claim 1, wherein the internal burst pressure is at least 10 MPa.

[Claim 9] The thin-film-composite hollow-fiber membrane of claim 1, wherein the active layer has a thickness that is between 100 and 600 nm.

[Claim 10] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has an outer diameter between 800 and 1200 μm.

[Claim 11] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has an inner diameter between 150 and 500 μm.

[Claim 12] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a wall thickness of at least 250 μm.

[Claim 13] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a wall thickness of at least 350 μm.

[Claim 14] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a porosity between 55% and 80%.

[Claim 15] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a maximum tensile stress of at least 5.5 MPa.

[Claim 16] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a Young's Modulus of at least 170 MPa.

[Claim 17] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a structural parameter below 0.9 mm.

[Claim 18] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a pure water permeability of at least 25 LMH/MPa.

[Claim 19] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a NaCl rejection rate of at least 90%.

[Claim 20] The thin-film-composite hollow-fiber membrane of claim 1, wherein the hollow-fiber membrane has a NaCl rejection rate of at least 97%.