CLAIMS

1. An anti-fouling, semi-permeable membrane comprising a porous support layer, a thin film composite (TFC) layer formed on a surface of the support layer, and a cross-linked polyvinyl alcohol (PVA) layer formed on top of the TFC layer, wherein the cross-linked PVA layer is the reaction product of PVA and a cross-linking agent, said cross-linking agent being a polybasic acid comprising three or more acid groups or precursors thereof, said precursors of acid groups being selected from the group comprising aldehydes, acid halides and alkali metal salts of carboxylic acids,
characterized in that
the PVA is derived from hydrolysis of polyvinyl acetate, the degree of hydrolysis of the polyvinyl acetate being from 90% to 99.9%, and in that
the viscosity of the PVA measured as a 4% aqueous solution at 20°C is between 28 mPa·s and 80 mPa·s.

2. The anti-fouling membrane according to claim 1, wherein the viscosity of the PVA measured as the 4% aqueous solution at 20°C is between 30 mPa·s and 60 mPa·s.

3. The anti-fouling membrane according to any one of claims 1 or 2, wherein the TFC layer comprises aquaporin water channels.

4. The anti-fouling membrane according to claim 3, wherein the aquaporin water channels are present in vesicles.

5. The anti-fouling membrane according to claim 4, wherein the vesicles are polymersomes comprising one or more polymers.

6. The anti-fouling membrane according to any one of claims 1 to 5, wherein the polybasic acid is selected from the group consisting of citric acid, 1,2,3,4-butanetetracarboxylic acid, 2,3,5-hexanetricarboxylic acid, and 1,2,3-butanetricarbaoxylic acid.

7. A method of preparing an anti-fouling, semi-permeable membrane comprising the steps of:

a. providing a semi-permeable membrane comprising a porous support layer having a thin film composite (TFC) layer formed on a surface thereof,

b. applying a layer of an aqueous PVA mixture of polyvinyl alcohol and a cross-linking agent to the TFC layer surface of the membrane, and

c. allowing the mixture to react,

wherein the cross-linking agent is a polybasic acid having three or more acid groups or precursors thereof, said precursors of acid groups being selected from the group comprising aldehydes, acid halides and alkali metal salts of carboxylic acids,

characterized in that
the PVA is derived from hydrolysis of polyvinyl acetate, the degree of hydrolysis of the polyvinyl acetate being from 90% to 99.9%, and in that
the viscosity of the PVA measured as a 4% aqueous solution at 20°C is between 28 mPa·s and 80 mPa·s.

8. The method according to claim 7, wherein the semi-permeable membrane comprising a support layer having a thin film composite layer formed on a surface thereof is treated with an aqueous glycerol solution prior to the application of the aqueous PVA mixture.

9. The method according to claim 8, wherein a glycerol solution is applied to the support layer surface of the TFC membrane prior to the application of aqueous PVA mixture.

10. The method according to claim 8 or 9, wherein the concentration of the glycerol in the glycerol solution is 5% by weight to 80% by weight.

11. The method according to any one of claims 7 to 10, wherein the polybasic acid is selected among the group consisting of citric acid, 1,2,3,4-butanetetracarboxylic acid, 2,3,5-hexanetricarboxylic acid, and 1,2,3-butanetricarbaoxylic acid.

12. The method according to claim 11, wherein the concentration by weight of polybasic acid is equal to or higher than the concentration by weight of the PVA in the aqueous PVA mixture.

13. The method according to claim 12, wherein the concentration by weight of citric acid is at least twice the concentration of the PVA in the aqueous mixture.