Claims

1. A porous hollow fiber membrane containing a vinylidene fluoride-based resin, characterized by:

having a gradient structure in which a pore diameter of pores in the hollow fiber membrane gradually becomes smaller at least toward one of inner and outer peripheral surface sides; and

being hydrophilized by containing a crosslinked body of a polyvinylpyrrolidone-based resin; wherein

a water permeation amount at an inter-membrane differential pressure of 0.1 MPa is 3000 to 40000 $L/m^2/hr$; and

a fractionation particle diameter is 0.001 to 0.5 μm.

2. The hollow fiber membrane according to claim 1, wherein a content of the crosslinked body is 0.1 mass % or higher and lower than 15 mass %.

3. The hollow fiber membrane according to claim 1 or 2, wherein a K-value of the polyvinylpyrrolidone-based resin is 30 to 120.

4. The hollow fiber membrane according to any one of claims 1 to 3, wherein the hollow fiber membrane is composed of a single layer.

5. The hollow fiber membrane according to any one of claims 1 to 4, wherein the crosslinked body is obtained by crosslinking the polyvinylpyrrolidone-based resin contained in the hollow fiber membrane before crosslinking in forming the hollow fiber membrane before crosslinking.

6. A method for producing the hollow fiber membrane according to any one of claims 1 to 5, comprising:

a step of preparing a membrane forming solution containing a vinylidene fluoride-based resin, a polyvinylpyrrolidone-based resin and a solvent;

a step of extruding the membrane forming solution into a hollow fiber;

a step of solidifying the membrane forming solution extruded into a hollow fiber and forming a hollow fiber membrane before crosslinking; and

a crosslinking step of crosslinking the polyvinylpyrrolidone-based resin in the hollow fiber membrane before crosslinking.

7. The method for producing the hollow fiber membrane according to claim 6, wherein the membrane forming solution is such that a content of the vinylidene fluoride-based resin is 1.54 to 4.38 in mass

ratio to that of the polyvinylpyrrolidone-based resin.

8. The method for producing the hollow fiber membrane according to claim 6 or 7, wherein the crosslinking step is a step of immersing the hollow fiber membrane before crosslinking in an aqueous solution containing a radical initiator.