Preparation of micro-porous polyethersulphone hollow fibre membranes using non-solvent vapour-induced phase separation - DTU Orbit (16/09/2019)

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Using a dope comprised of polyethersulphone (PES):N,N-dimethylacetamide: diethylene glycol (DEG) 17:43:40 (wt%), micro-porous PES hollow fibre membranes were prepared by non-solvent vapour-induced phase separation (VIPS). The effects of bore fluid solution composition, coagulation bath temperature, air-gap distance and humidity on the morphologies of micro-porous PES hollow fibre membranes were investigated. Light transmission microscopy was used to determine the precipitation rate during VIPS stage as well as during non-solvent liquid-induced phase separation (LIPS) stage. The mean pore radius of PES hollow fibre UF membranes with sponge-like structures could be calculated by Image software from the SEM images. The mean pore radius of outer surface was about 0.1 μm (0.092 ~ 0.131 μm, PES3 ~ PES14) while the mean pore radius of the inner surface of PES hollow fibre membranes was 0.051-0.064 μm (PES12 and PES14). Pure water permeation fluxes and rejections were closely related to both the inner and outer skin layers. When inner and outer surfaces possessed open structure, the pure water permeation fluxes increased, whereas rejections decreased accordingly. PES hollow fibre membranes with pure water permeation flux from 387 to 1210 L.m-2.h-1.bar-1 as well as rejection of 10.1%-98.1% could be achieved by adjusting air humidity, air-gap distance and composition of bore fluid solution. Pure water permeation fluxes of PES12, PES13 and PES14 with sponge-like structures were higher than 1000 L.m-2.h-1.bar-1 and their BSA rejections were only about 10%.

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