Preparation of PVDF hollow fiber ultrafiltration membrane via phase inversion/chemical treatment method

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\textbf{ABSTRACT}

Poly(vinylidene fluoride) (PVDF) hollow fiber membranes were prepared via a phase inversion/chemical treatment method, using N,N-dimethylacetamide (DMAc) as solvent, Calcium carbonate as inorganic additive, and water and HCl as coagulation media. Effects of external coagulation bath and bore fluid composition on membrane performance were investigated by using scanning electron microscopy, mechanical properties, porosity, average bubble point pressure, and permeation performance. The results show that: (1) The cross-section morphology of membranes have no significant change, exhibiting a two-layer finger-like structure extended to the middle of the cross-section. (2) The roughness of the external surface increased considerably and the number of the surface pores increased as well when we introduced HCl as the second coagulation. The permeation experiments reveal that acid treatment had no impact on fibers which had precipitated completely. (3) The number and pore size underlying the inner skin layer increased when bore fluid changed from DI water to 10\% acetic acid, leading to the decrease of porosity and tensile strength. Moreover, the pure water flux increased from 360 to 580 L/(m\textsuperscript{2} h) without the significant change of BSA rejection. The PVDF/CaCO\textsubscript{3} membranes prepared from the dope with 10\% acetic acid as the bore fluid and 1 mol/L HCl as second coagulation bath had the best ultrafiltration performance.

\textbf{Keywords}: Poly(vinylidene fluoride); Hollow fiber membrane; Calcium carbonate; Chemical treatment; Ultrafiltration

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