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Hollow fiber ultrafiltration membranes from poly (vinyl chloride): preparation, morphologies, and properties

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Abstract

Hollow fiber poly(vinyl chloride) membranes were prepared by using the dry/wet spinning method. Cross-section, internal, and external surfaces of the hollow fibers structure were studied by SEM. The pore size and pore size distribution of the hollow fibers were measured by a PMI capillary flow porometer. UF experiments of pure water and aqueous solution of PVP K-90 were carried out. The effect of the PVC concentration on the hollow fibers mechanical properties was also investigated. It was found that the PVC fibers cross-sectional structure was affected by the polymer concentration in the dope solution. In particular, reduction of macrovoids size was observed when increasing PVC concentration from 15 to 19 wt%. The pore size distribution of the PVC hollow fibers was controlled by adjusting the PVC concentration. Indeed, an increase of PVC concentration up to 19 wt% leads to fibers with sharp pore size distribution (the 99% of pores is about 0.15 μm).The pure water permeation flux decreased from 162 to 128 (l/m2 · h · bar), while the solute separation performance increased from 82 to 97.5%, when increasing the PVC concentration. The elongation at break, the tensile strength, and the Young's modulus of the PVC hollow fibers were improved with PVC concentration in dope solution.

Keywords

hollow fiber membrane; morphology; poly(vinyl chloride); pore size distribution; separation performance

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