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Study on properties of ultrafiltration membrane prepared by hydrolyzed polyacrylonitrile

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ABSTRACT

Hydrophilic polyacrylonitrile (HPAN) ultrafiltration membranes were successfully prepared by the phase inversion method with hydrolysis modified polyacrylonitrile as the basic materials. The effect of hydrolysis time of polyacrylonitrile on the morphology and performance of the HPAN ultrafiltration membranes were investigated by the approaches of ultrafiltration experiments, porosity testing, scanning electron microscopy, attenuated total reflectance-Fourier-transform infrared spectroscopy, water contact goniometer angle and dynamic anti-contamination. The results showed that the hydrophilicity, pore connectivity, porosity and pure water flux of the membranes could be improved by increasing the hydrolysis time of polyacrylonitrile (PAN). However, the longer hydrolysis time will lead to degradation of PAN, resulting in a decrease of the retention rate and mechanical strength. Through comprehensive consideration, when the hydrolysis time was 2 h, the HPAN ultrafiltration membrane exhibited excellent water permeate flux and good anti-pollution ability almost without decreasing the retention and mechanical strength. Thus, the proper hydrolysis degree could improve the separation efficiency, prolong the life cycle and reduce the operational costs of the polyacrylonitrile membrane. In addition, the presence of carboxyl groups due to hydrolysis provides unlimited possibilities for further modification of HPAN membranes.

Keywords: Polyacrylonitrile membrane; Hydrolysis modified; High water flux; Anti-pollution

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