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PERFORMANCE AND MORPHOLOGY EVALUATION OF THIN FILM COMPOSITE POLYACRYLONITRILE/ POLYAMIDE NANOFILTRATION MEMBRANES CONSIDERING THE REACTION TIME

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Polyacrylonitrile/polyamide (PAN/PA) thin film composite nanofiltration membranes were manufactured by interfacial polymerization (IP) of trimesoylchloride reacting with piperazine, in the presence of triethylamine. The influence of IP reaction time up to 100 s on the membrane performance and structure was investigated considering flux, rejection, structural morphology and roughness of the membrane using permeation test, scanning electron microscopy, atomic force microscopy as well as fourier transform infrared spectroscopy. Structural evaluation of membranes revealed that the average PA surface pore size was reduced initially up to 60 s of reaction due to the crosslinking process and PA layer compaction increment, however, became larger at longer reaction times. The PA layer effective thickness grew up with IP time and became constant after 60 s. The best water flux and Na_2SO_4 salt rejection were obtained at 60 s of reaction, which were 100 m^3/day and 87 % at pressure of 13 barg. Variation trends of permeation and morphological results showed accordance that confirmed their accuracy. Comparison of the Na^+ rejection value with the rejection of commercialized NF membrane of Dow Company (NF90-400/34i) showed acceptable result for membrane performance.

Keywords: interfacial polymerization, polyamide, nanofiltration, composite membrane, reaction time.

1. Introduction

Polyacrylonitrile (PAN) membranes have attracted a great deal of attention amongst both academia and industrial researchers as UF-membrane due to its superior characteristics in hydrophilicity, solvent stability and cost effectivity. PAN membranes could offer great advantages as support of nanofiltration (NF)

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