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The performance improvement of hollow fiber composite reverse osmosis membranes by post-treatments

Lei Ni, Juan Wang, Yufeng Zhang*, Jianqiang Meng*, Yang Zhang

State Key Laboratory of Hollow Fiber Membrane Materials and Processes, School of Material Science and Engineering, Tianjin Polytechnic University, Tianjin 300160, P.R. China
Tel./Fax: +86-22-24528074; email: zyf9182@tjpu.edu.cn, jianqiang.meng@hotmail.com

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ABSTRACT

While the technology of spiral-wound reverse osmosis membrane tends to be more and more mature, the reports of hollow fiber reverse osmosis membranes are still relatively sparse. In this report, the hollow fiber composite reverse osmosis membranes were prepared by the interfacial polymerization of m-phenylenediamine (mPDA) and trimesoyl chloride (TMC) using polysulfone ultrafiltration membrane as the support. Post-treatments including with NaOCl solution and polyvinly alcohol (PVA) solution were employed to improve the performance of the membranes. The chemical composition and surface structure of the membranes obtained at the different post-treatment conditions were characterized by attenuated total reflection Fourier transform infrared (ATR-FTIR), X-ray photoelectron spectroscopy (XPS) and atom force microscopy (AFM). The results showed that the salt rejection of the membranes increases dramatically but the permeate flux decreases slightly after NaOCl and PVA solution treatment. The membrane treated with 500 ppm of NaOCl solution and 20 ppm of PVA solution by turn exhibited the salt rejection of 96.3% and pure water flux of 10.9 $l \cdot m^{-2} \cdot h^{-1}$) at 500 ppm NaCl solution, 100 psi and 25°C.

Keywords: Hollow fiber; Reverse osmosis; Thin-film composite membrane; Post-treatment; Hypochlorite treatment; Polyvinyl alcohol

*Corresponding author.

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