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A novel polyesteramide thin film composite nanofiltration membrane prepared by interfacial polymerization of serinol and trimesoyl chloride (TMC) catalyzed by 4‑dimethylaminopyridine (DMAP)

Ruijun Zhang[a], Shuili Yu[a,b*], Wenxin Shi[a**], Wei Wang[a], Xiaoying Wang[c], Zhiqiang Zhang[a], Li Li[a], Bing Zhang[a], Xian Bao[a]

[a]State Key Laboratory of Urban Water Resource and Environment, School of Municipal and Environmental Engineering, Harbin Institute of Technology, Harbin 150090, P. R. China
[b]State Key Laboratory of Pollution Control and Resource Reuse, College of Environmental Science & Engineering, Tongji University, Shanghai 200092, P. R. China
[c]School of Architectural Engineering, Sanming University, Sanming 365004, P. R. China

swx@hit.edu.cn
ysl@tongji.edu.cn

Abstract:

In order to integrate the advantages of polyamide thin film composite (TFC) nanofiltration (NF) membranes and that of polyester TFC NF membranes, a novel polyesteramide (PEA) TFC NF membrane was prepared by interfacial polymerization between serinol and trimesoyl chloride (TMC) and catalyzed by 4−dimethylaminopyridine (DMAP) on a flat-sheet polyethersulfone (PES) substrate membrane. The membrane performance was maximized by optimizing different preparation parameters. The reaction process was divided into four basic patterns. X-ray photoelectron spectroscopy (XPS) and infrared spectroscopy confirmed the membrane had a partially cross-linked active layer that contained ester bonds, amide bonds and residual hydroxyl groups. Morphology analysis showed the surface of the PEA-TFC-NF membrane was grainy, which was different from the typical polyamide membranes. The contact angle and zeta potential measurements confirmed the PEA-TFC-NF membrane was highly hydrophilic and negatively charged across the entire pH range tested. The optimized PEA-TFC-NF membrane had a MWCO of 474 Da and water permeability of 6.0 $L \cdot m^{-2} \cdot h^{-1} \cdot bar^{-1}$ at 0.5 MPa and 25°C. The membrane salt rejections followed the order of Na_2SO_4 > $MgSO_4$ > NaCl > $MgCl_2$, which were 96.27%, 83.92%, 58.68% and 28.76%, respectively. Moreover, the PEA-TFC-NF membrane displayed good antifouling ability.

Keywords: Nanofiltration membrane; Polyesteramide; Serinol; Antifouling.