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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)

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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 $6.0 \text{ L}\cdot\text{m}^{-2}\cdot\text{h}^{-1}\cdot\text{bar}^{-1}$ at 0.5 MPa and 25°C. The membrane salt rejections followed the order of $\text{Na}_2\text{SO}_4 > \text{MgSO}_4 > \text{NaCl} > \text{MgCl}_2$, 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.

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