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Sulfonated poly(arylene ether sulfone) thin-film composite reverse osmosis membrane containing SiO_2 nano-particles

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ABSTRACT

Novel thin-film nano-composite membranes containing SiO_2 nano-particles are successfully fabricated via interfacial polymerization with trimesoyl chloride (TMC), sulfonated poly(arylene ether sulfone) copolymers and silica (SiO_2) nano-particles on a polysulfone (PS) support membrane. Sulfonated poly(arylene ether sulfone) copolymers containing carboxylic and amino groups (cPES) are successfully prepared via direct polymerization as novel thin-film composite (TFC) reverse osmosis (RO) membrane material. Mesoporous SiO_2 nano-particles are also successfully synthesized. The synthesized cPES copolymers, SiO_2 nano-particles and fabricated cPES membranes are characterized by nuclear magnetic resonance spectroscopy (NMR), Fourier transform infrared spectroscopy (FT-IR) and scanning electron microscope (SEM). The incorporation of SiO_2 nano-particles were confirmed by energy dispersive X-ray spectroscopy (EDX). Moreover, the effects of different fabrication conditions on performance are investigated. The cPES membrane with 1% (w/w) SiO_2, which is cured at 70°C, exhibited the high salt rejection value (96.8%) with respect to NaCl and good water flux value (32 L/m^{2}h).

Keywords: RO membrane; Sulfonated poly(arylene ether sulfone); Nanocomposite membrane; Desalination

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