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Isotropic macroporous polyethersulfone membranes as competitive supports for high performance polyamide desalination membranes

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Abstract

Novel macroporous isotropic polyethersulfone (PES) base membranes were developed using combined processes of vapor- and non-solvent-induced phase separation. Optimization of different preparation parameters was carried out. The newly prepared PES membranes exhibited well-defined isotropic porous structures with optimized average barrier pore diameter of ~100 nm as well as hydrophilic surface and high water permeability. These isotropic membranes together with two more supports (i.e. commercial PES microfiltration and anisotropic hydrophobic polysulfone membranes), were utilized for the fabrication of polyamide (PA) thin-film composite (TFC) desalination membranes. The resulted PA TFC membranes showed significantly different film morphologies, surface characteristics as well as separation performance. The PA TFC membranes based on the hydrophilic PES supports with isotropic and optimized pore size, developed in this study, showed superior water permeability compared to the composite membranes based on the other supports, without compromising the salt rejection and providing high stability for the PA selective layer.