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Polyvinylpyrrolidone modified graphene oxide as a modifier for thin film composite forward osmosis membranes

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Abstract

Polyvinylpyrrolidone (PVP) modified graphene oxide (GO), hereinafter referred to as PVP-GO, was synthesized as a novel modifier to fabricate thin film nanocomposite forward osmosis membranes. The results indicated that by coating PVP on the surface of GO nanosheets, the dispersibility of GO was increased and the aggregation of GO was reduced. Compared with the pristine and GO modified FO membranes, the PVP-GO modified membranes enhanced the desalination performance giving both a higher water flux and lower reverse solute flux. When using 2 $mol \cdot L^{-1}$ of NaCl as the draw solution and 10 $mmol \cdot L^{-1}$ NaCl as the feed solution, the water flux of the FO membrane modified with 0.0175 wt.% of PVP-GO reached 33.2 LMH in the ALDS mode (the active layer facing the draw solution), which was 3.3 times higher compared with the water flux of the pristine FO membranes. Improved desalination performances of PVP-GO modified FO membranes were attributed to the better dispersibility of the PVP-GO nanosheets and increased surface hydrophilicity of the modified FO membranes. This study indicated that PVP-GO is an effective modifier to enhance the performance of FO membranes.

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