

Novel thin film nanocomposite forward osmosis membrane embedded with amine functionalized UiO-66 metal organic frameworks as an effective way to remove heavy metal Cr³⁺ ions

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ABSTRACT

This research work reports a simple and novel method to fabricate thin film nanocomposite forward osmosis membranes (TFN-FO). The newly designed TFN membrane was fabricated by incorporation of UiO₆₆^{NH₂} nanoparticles within a polyamide thin film by using the interfacial polymerization (IP) of *m*-phenylenediamine/aminated (MPD/UiO₆₆^{NH₂}) aqueous and trimesoyl chloride (TMC) organic solution. Then, the morphology characteristics, water permeability, and removal behavior of Cr³⁺ ions were thoroughly evaluated. Compared with the unmodified thin film composite (TFC) membrane, the UiO₆₆^{NH₂} modified TFN-U₈₀₀ membrane (800 ppm nanofiller concentration) presented higher hydrophilicity and better overall FO performance. Additionally, the TFN-U₈₀₀ membrane exhibited greater metal removal for heavy metal Cr³⁺ ions in AL-FS mode (feed solution in contact with active layer) than the control TFC membrane, arising from its improved polyamide (PA) layer characteristic. We expect that this novel technique can be applied to fabricate TFN-FO membranes with good heavy metal separation performance.

Keywords: Heavy metal; Thin film nanocomposite; Forward osmosis; Active layer

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