Effect of Number of Layers and Deposition Time On Layer-By-Layer (LbL) Composite Forward Osmosis Membrane

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Abstract:
Forward Osmosis (FO) refers as osmotic process for water transfer through a semi-permeable membrane that results in separation of water from dissolved solutes. This method has been explored due to low fouling propensity and low energy requirements since the driving force is an osmotic pressure gradient between two solutions which are the feed and draw solution. This research focus on determining the optimum FO membrane by controlling number of polyelectrolyte bilayers and deposition time of membrane for seawater desalination. Poly (diallyl-dimethylammoniumchloride), PDADMAC and Poly (sodium 4-styrene-sulfonate), PSS were used as active monomers to generate a thin layer on the ultrafiltration membrane support through Layer by Layer (LbL) deposition method. The FO lab-scale experiment was performed by using 1.75M sodium sulphate (Na2SO4) as draw solution whereas deionized water (DI) as feed. This research was conducted based on different number of bilayers (5,10 and 15 bilayers) and deposition time (5,10 and 15 minutes) which affected the water flux. After the best parameters were obtained, treatment on synthetic seawater (35 g/L NaCl) was conducted and the results were compared with real seawater. Among the modified membranes, it was found that the membrane 5FO15 which membrane with 5-bilayers of polyelectrolytes and 15 minutes of deposition time exhibited the highest water flux (4.75 L/m2.h). Sea water shows lower water flux than synthetic seawater due to the existing of other solute which may contribute membrane fouling. From this research, polyelectrolyte membrane exhibited a high potential of treating seawater in Malaysia by FO process which is a good option of water treatment.

Keywords: Forward Osmosis; Polyelectrolytes; Layer-By-Layer; Water Flux;

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