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Preliminary studies of seawater desalination using forward osmosis

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ABSTRACT

Forward osmosis is an emerging technology that has gained increasing attention in the field of seawater desalination. A recent innovation using ammonia-carbon dioxide solution as a draw fluid to remove water from saline feed through membranes has been widely discussed. This process has immense potential for seawater desalination due to its promising low energy consumption. This project attempts to study the forward osmosis performance with respect to different ammonia-carbon dioxide draw solutions and membranes. A simple forward osmosis test rig using a flat-sheet membrane was built. The results suggest that internal concentration polarization in the membrane lowered the anticipated flux. This phenomenon was found to be more prominent in higher concentration feeds. Increasing the temperature improved flux but the effects were less significant for higher concentration feeds. The cellulose triacetate membrane tested would be more compatible with sucrose as draw fluid in terms of flux compared with that of the ammonia carbon dioxide draw solution which is of a high molarity. If the ammonia carbon dioxide should be used as draw solution, the ammonium carbonate would be preferred.

Keywords: Forward osmosis; Cellulose triacetate membrane; Internal concentration polarization; Ammonia-carbon dioxide draw fluid; Osmotic de-swelling

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