

A NOVEL HYBRID FORWARD OSMOSIS-NANOFILTRATION TECHNOLOGY FOR SEAWATER DESALINATION

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ABSTRACT

Currently, the reverse osmosis process (RO) is one of the main technologies used for seawater desalination. It is effective in water reclamation but requires a large amount of pumping energy. Hence, there is a need to develop novel technology to lower the energy requirement for seawater desalination. The aim of this project is to develop a novel hybrid forward osmosis (FO) - nanofiltration (NF) technology for seawater desalination. The FO process relies on the concentration difference between two solutions as a driving force to transport water across a semi-permeable membrane. It can remove all other salts and impurities of seawater, and the permeate water contains only a single solute. Nanofiltration (NF) will then be used to obtain clean water and recycle the solute for use in the FO process. In this project, a dual salt technology was proposed for the FO process, with the combinations of firstly, sodium sulfate and magnesium sulfate, secondly, magnesium chloride and magnesium sulfate. We tested the dual salts in different proportions and concentrations to investigate the optimal operating parameters for both FO and NF combined. From the results obtained, the combination of magnesium chloride and magnesium sulfate yielded better water flux than sodium sulfate and magnesium sulfate. The magnesium chloride-magnesium sulfate (1:3) obtained better flux and rejection in NF while 3:1 excelled in FO. Hence, it was concluded that the 1:1 was the optimum proportion.