



Production of drinking water from seawater using membrane distillation (MD) alternative: direct contact MD and sweeping gas MD approaches

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ABSTRACT

In this work, two-membrane distillation (MD) modes, direct contact MD, and sweeping gas MD were investigated for synthesized and real (Persian Gulf) seawater desalination. A commercial PTFE membrane with 0.22 μm pore size was characterized (using atomic force microscopy and scanning electron microscopy) and was used for experiments. A multipurpose plate and frame MD module was used for desalination experiments. The effects of various operating conditions and MD module design, as well as feed type on the permeation flux have been studied. The feed temperature was found to be the most effective operating parameter. The flow rate in both sides of the MD module was found to be effective; however, the feed flow rate showed more influence. Both the investigated modes were successfully applied for seawater desalination, whilst the direct contact mode seems to provide more permeation flux. The results indicated that the MD module design has significant effect on the overall efficiency. At optimum conditions, a 99% salt rejection was achieved for both the investigated MD modes.

Keywords: Desalination; Drinking water; Persian Gulf seawater; Direct contact MD; Sweeping gas MD; PTFE membrane; Module design; Permeation flux

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