

Author's Accepted Manuscript

Understanding the impact of membrane properties and transport phenomena on energetic performance of membrane distillation desalination

Akshay Deshmukh, Menachem Elimelech



PII: S0376-7388(17)30832-3
DOI: <http://dx.doi.org/10.1016/j.memsci.2017.05.017>
Reference: MEMSCI15251

To appear in: *Journal of Membrane Science*

Received date: 25 March 2017
Revised date: 4 May 2017
Accepted date: 6 May 2017

Cite this article as: Akshay Deshmukh and Menachem Elimelech, Understanding the impact of membrane properties and transport phenomena on energetic performance of membrane distillation desalination, *Journal of Membrane Science*, <http://dx.doi.org/10.1016/j.memsci.2017.05.017>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

Understanding the impact of membrane properties and transport phenomena on energetic performance of membrane distillation desalination

Akshay Deshmukh^{a,b}, Menachem Elimelech^{a,b*}

^a*Department of Chemical and Environmental Engineering, Yale University, New Haven, Connecticut 06520-8286, United States*

^b*Nanosystems Engineering Research Center for Nanotechnology-Enabled Water Treatment, Yale University*

*Corresponding author. Address: P.O. Box 208286, Yale University, New Haven, CT 06520; Tel.: +1 (203) 432-2789; fax: +1 (203) 432-2881. menachem.elimelech@yale.edu

Abstract

Direct contact membrane distillation (DCMD) is a thermal desalination process that is capable of treating high salinity waters using low-grade heat. As a water treatment process, DCMD has several advantages, including the utilization of waste heat (below 100°C), perfect rejection of nonvolatile solutes, low areal footprint, and high scalability. However, the energy efficiency of DCMD is relatively low compared to other work-based and thermal desalination processes. In this study, we aim to quantify how membrane properties and process conditions affect the exergy or second-law efficiency (η_{II}) of a DCMD desalination system with external heat recovery. In particular, we analyze how the membrane permeability coefficient (B) and thermal conduction coefficient (\bar{K}) impact MD performance. We show that increasing the B value of a membrane by reducing its thickness, initially leads to an increase in η_{II} before conductive heat loss through the membrane causes η_{II} to fall. For a typical MD membrane with a porosity of 0.90, material

Download English Version:

<https://daneshyari.com/en/article/4988805>

Download Persian Version:

<https://daneshyari.com/article/4988805>

[Daneshyari.com](https://daneshyari.com)