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Simulation study of desalination performance for two large-scale air gap membrane distillation modules

H. Chang*, Y.-H. Chou, C.-D. Ho, C.-L. Chang, H.-J. Chen

Energy and Opto-Electronic Materials Research Center, Department of Chemical and Materials Engineering, Tamkang University, New Taipei, Taiwan
Tel. +886 (2) 2623 2094; Fax: +886 (2) 2620 9887; email: nhchang@mail.tku.edu.tw

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ABSTRACT

Being capable of utilizing low-grade thermal energy, membrane distillation (MD) has evolved as a promising technology for desalination. This paper reports the simulation study of two large-scale MD modules reported in the literature, a spiral wound type and a flat plate type. A mathematical model, which considers the heat and mass transfer mechanisms for all the composing layers of the module, is used. For both modules, the heat and mass transfer resistance and the performance enhancement by modifying design parameters and operating conditions are analyzed. The significant directions and quantitative potential of improvement are identified. Compared to the bases cases, the flux enhancement from modifying module parameters can be as high as about 10% for the spiral wound module and about 100% for the flat plate module. The flux enhancement from modifying operation conditions can be as high as about 50% for both modules.

Keywords: Air gap membrane distillation; Membrane distillation; Desalination; Modeling

*Corresponding author.