How far can membrane characteristic parameters bestow at the membrane distillation performance: Modeling and simulation

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Abstract

A mathematical model of simultaneous heat and mass transfer was presented to describe for the first time the effects of the variation in the characteristic parameters of the membrane during the VMD process on the permeation flux. The modelling approach was derived by dividing the module axially into multi-cells and a set of nonlinear simultaneous equations representing the VMD process were numerically solved via FSOLVE code. The validation of the presented model was estimated by simulation with a wide range of 135 diverse published experimental results related to the influence of various operating conditions, module properties, and membrane characteristics on the water permeation flux through the membrane. A good agreement was obtained between the experimental data and the results of the developed model. The same change in the membrane characteristics during the MD operation reported experimentally in the literature was confirmed by the simulation results of the developed model.

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