Modeling and Optimization of Hybrid FO-VMD Process

김도연, 박기호, 양대륙*
고려대학교
(dryang@korea.ac.kr*)

A forward osmosis (FO) process has been widely studied as a promising candidate of seawater desalination method due to its low energy requirement. Because water permeation in the FO process is induced by natural osmosis, external energy requirement is theoretically negligible. Water permeated into the draw solution side should be again separated for pure water production as well as recycle of draw solution. In this study, a vacuum membrane distillation (VMD) is suggested for draw solute separation. The VMD process also has been researched for seawater desalination by itself. However, employing the VMD to draw solute separation in the FO process is more favorable in aspect to energy requirement, since the latent heat of water is much larger than that of a volatile draw solute. In this study, ethanol is selected as a draw solute and its performance in the FO process is investigated by modeling so as to demonstrate the feasibility of ethanol draw solution. Also, the VMD process is modeled and simulated to estimate separation efficiency and energy requirement. Furthermore, using the developed model, optimal configuration and operating conditions in the VMD process are found in order to reduce external energy requirement.