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Performance of a newly developed titanium oxide nanotubes/polyethersulfone blend membrane for water desalination using vacuum membrane distillation

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The present paper introduces a comprehensive study of the performance of newly developed titanium oxide nanotubes (TNTs) incorporated into a Polyethersulfone (PES) blend membrane for desalination using vacuum membrane distillation (VMD) process. The study examines the effect of different operating conditions. The results showed a maximum salt rejection of 98% and a permeate flux of 15.2 kg/m 2 h at 7000 ppm feed salt concentration for the TNTs–PES membrane at a temperature of 65 °C and a vacuum pressure of 300 mbar with feed flow rate of 11 mL/s. A comparison between the performance of the developed TNTs-PES membrane, and commercial Polytetrafluoroethylene (PTFE) membrane was performed at different feed salt concentrations. The achieved results showed a significant improvement in the performance of the new membrane compared to the commercial PTFE membrane, where the salt rejection reached 99.3% at feed concentration 3000 ppm and 96.7% at 35,000 ppm using the new membrane, compared to salt rejection of up to 90.6% at 3000 ppm and 62.5% at 35,000 ppm using PTFE membrane. The dense TNTs layer formed on the top surface of the TNTs-PES blend membrane is considered a selective layer that prevents salt passage through the membrane. The decline in permeate flux may be overcome by membrane washing every hour.

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