

Title:

Membrane distillation using carbonized cloth

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Abstract:**1. Introduction**

Membrane distillation (MD) enables sea water desalination at low cost if heat discharged from factories can be used as a heat source for heating seawater. Porous fluorinated membranes are mainly used in MD, but they are expensive and difficult to dispose of. In this study, we conducted MD using carbonized fabrics obtained by high-temperature treatment of fabric fibers and investigated whether carbonized fabrics can be used as an alternative material to fluorinated membranes.

2. Experiments

PVDF membranes prepared by a non-solvent induced phase separation method and commercial PTFE filter paper were used as porous fluorinated membranes. The carbonized cloth was obtained by carbonizing the cloth at high temperature. The apparatus shown in Figure 1 was used for MD measurement. 3-25 wt% NaCl solution was used as the feed solution. For the evaluation of fouling resistance, the feed solution was NaCl solution plus bovine serum-derived albumin (BSA). The feed solution was heated so that the temperature on the membrane was approximately 60°C and circulated using a pump.

3. Results and Discussion

The water contact angle of the carbonized fabric was much higher than that of the PVDF membrane and equal to or higher than that of the PTFE membrane. In MD measurements, a linear relationship between the amount of permeate and time was observed. The MD flux was estimated from the slope of the liner relationship. MD flux across the carbonized fabric was about 12% higher than that across the PVDF membrane and equal to that across the PTFE membrane. The salt rejection was greater than 99.6% for all membranes. The carbonized cloth showed higher antifouling property than the PVDF membrane.

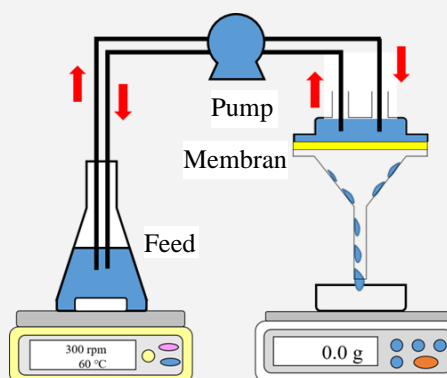


Fig. 1. Diagram of membrane distillation measurement.