SURFACE MODIFICATION OF PVDF MEMBRANE USING FORMIC ACID TO ENHANCE THE HYDROPHOBICITY FOR DESALINATION

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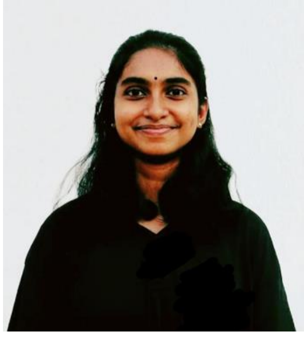
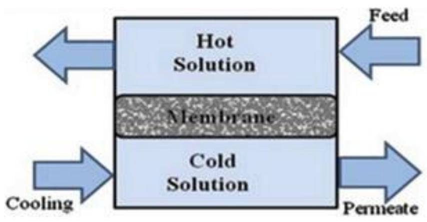
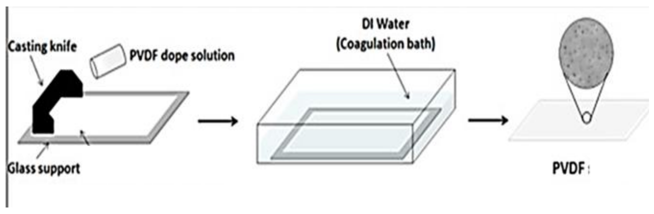


INTRODUCTION



- Membrane distillation (MD) is a new membrane separation technology using the temperature gradient created on membrane surfaces as a driving force.
- A few problems for practical application of membrane distillation process for desalination have to be settled, such as progressive wettability of the membrane.
- In this study to enhance the hydrophobicity of PVDF some modification made by treating the membrane with formic acid which is a simple and sustainable method of surface modification to eliminate fluorine atom.

METHODOLOGY



Membrane Preparation

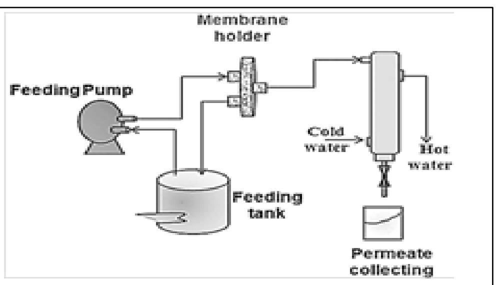
- Dope solution prepared using 20 wt% PVDF and 80 wt% NMP solvent.
- The membrane casted using phase inversion technique.

Surface modification

- PVDF membrane was immersed in formic acid for 5-7 hr at room temperature using different concentration of formic acid.

Membrane characterization

- Water contact angle
- FTIR
- Membrane performance test
  The membrane sample placed in test cells system.



BENEFITS OF MD FOR DESALINATION

- performed at lower operating pressure and lower temperatures than the boiling point of feed solution
- lower vapor space
- can use any form of low-grade waste heat or be coupled with solar energy systems
- recovery is higher than the RO process for seawater desalination
- permits very high separation factor of nonvolatile solute

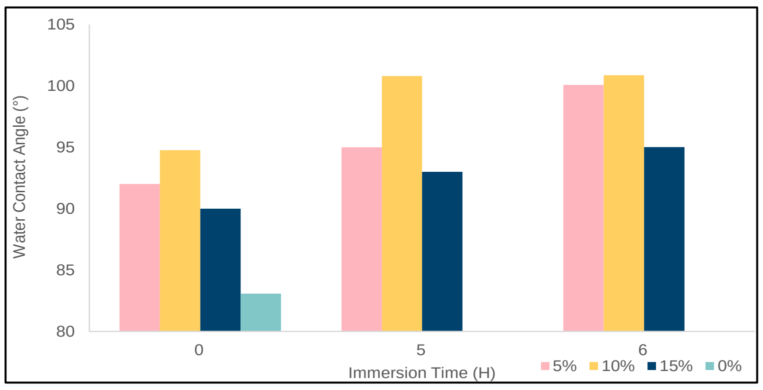
CONCLUSION

- In conclusion, the modification of PVDF membrane using carboxylic acid to enhance the hydrophobicity was successfully investigated.
- The result showed that by modifying the membrane with formic acid resulted in the increase in contact angle.
- It was subsequently shown through FTIR peaks that formic acid successfully modified the PVDF membranes.
- Highest salt rejection percentage was also obtained using M7 when the feed temperature is 60 °C.

OBJECTIVE

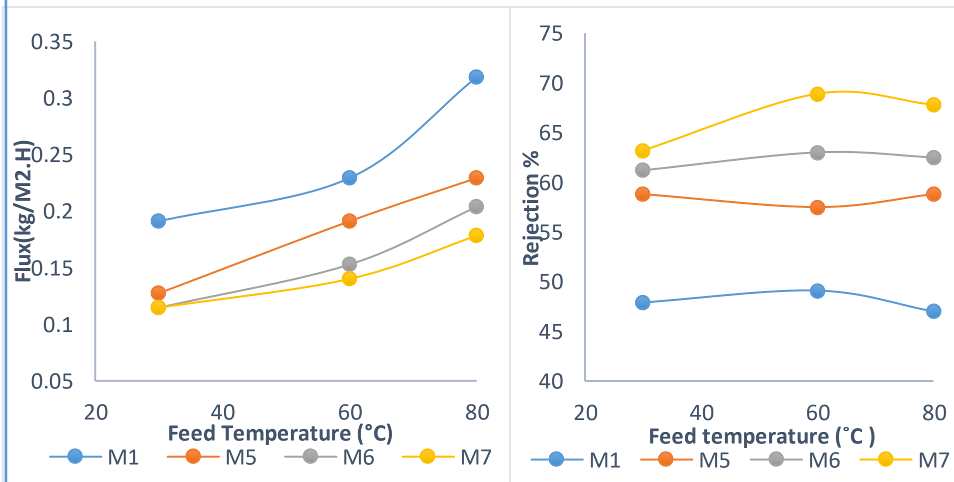
- To prepare PVDF membrane using the phase inversion method.
- To modify PVDF membrane surface using formic acid to increase its hydrophobicity.
- To observe characterisation of the produced membrane.
- To study the MD system using the membrane with permeate flux and salt rejection percentage by varying the feed temperature.

RESULTS AND DISCUSSION



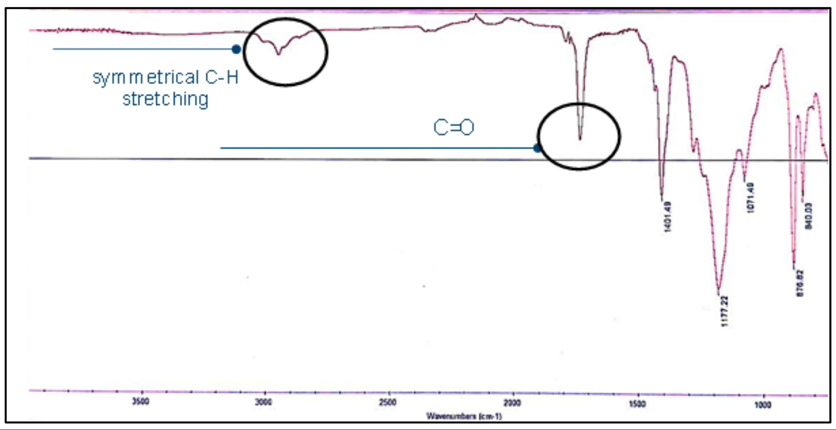
Effect of formic concentrations over different

- The hydrophobicity of the membrane increased more significantly when treated with 10 wt% formic acid compared to 5 wt%. 15 wt%.
- For all the membrane the contact angle increases as the immersion time increases.



Effects of feed temperature on the permeate flux and salt rejection

- The permeation flux of all the membranes increases along with increasing temperature of the feed solution.
- The permeate flux decreases as the contact angle of the membrane increases.
- The salt rejection factor values were greater than 47% for all membranes.
- Among above membranes, M7 shows the highest salt rejection at 60°C.



- The appearance of the new peaks in FTIR graph the modified membrane are due to the effect of carboxyl group, which indicates that the modification by formic acid has occurred effectively.