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# EFFECTS OF OSMOTIC AGENT CONCENTRATION AND TYPE ON THE PERFORMANCE OF OSMOTIC MEMBRANE DISTILLATION

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## ABSTRACT

A thin Polytetrafluoroethylene (PTFE) microporous layer supported by a polypropylene (PP) net (TF200 from pall–Gelman) with 0.00275 m² total surface area of the membrane was used for the removal of water from dilute aqueous solutions in osmotic membrane distillation process. The influence of osmotic agent concentration and type such as, (1–5 mol/L) calcium chloride ($CaCl_2$) and (2–5 mol/L) sodium chloride (NaCl) on the transmembrane flux was studied. The increase in the osmotic agent concentration (both of calcium chloride and sodium chloride) resulted in an increase in transmembrane flux. The calcium chloride ($CaCl_2$) showed higher transmembrane flux as compared to sodium chloride (NaCl). Besides, it was found that, there is no transmembrane flux using 1 mol/L of sodium chloride NaCl solution. Empirical correlation comprising of dimensionless numbers was used in order to estimate the water transport through the boundary layers (feed as well as osmotic agent OA side). The mass transport of water through the membrane has been estimated based on mode of diffusion mechanism in the pores by Knudsen or molecular diffusion. Theoretical results were estimated and compared with the experimental results. Based on the experimental results of OMD process, it was found that, there are 17% deviations between the theoretical and experimental results.

## INTRODUCTION

Osmotic membrane distillation (OMD) is one of the membrane distillation (MD) variants, operated at low temperature. The MD comprises a relatively novel membrane process, which can be applied for the separation of various aqueous solutions. The hydrophobic membranes, with the pores filled by the gas phase, are used in this process [1,2]. The advantages of osmotic membrane distillation compared to other separation processes can be summarized as: ambient operating temperature and pressure; less demanding mechanical membrane properties required; no or less degradation of heat-sensitive components; and higher concentrated feed can be achieved. OMD is a membrane transport process in which a liquid phase (most commonly an aqueous solution) containing one or more volatile components is allowed to contact one surface of a micro-porous membrane whose pores are not wetted by the liquid, while the opposing surface is in contact with a second non-wetting liquid phase in which the volatile components are soluble or miscible. The membrane thereby functions as a vapor gap between the two liquid phases, across which any volatile component is free to migrate by either convection or diffusion. The driving potential for such transport is the difference in vapor pressure of each