일반강연 II-12

Transport Properties of Crosslinked Poly Vinyl Alcohol Membrane in Pervaporation

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INTRODUCTION

PVA membrane was widely used in the dehydration pervaporation process. PVA membrane showed remarkable selectivity toward water and an excellent film-forming polymer, with a good resistance to organic solvents but it has poor stability in aqueous mixtures. Generally the PVA is manufactured by the hydrolysis reaction from poly vinyl acetate(PVAc) and so the degree of PVA hydrolysis is a major parameter for properties of PVA membrane such as the crystallinity and polarity.

The object of this work was to study the influence of the degree of PVA hydrolysis of membranes on the transport of water-isopropanol mixtures in pervaporation. The study was focused on the partial flux of individual component and the selectivity to water from pervaporation experiments. In addition to the general study, we investigated the coupling transport of individual component with the degree of PVA hydrolysis using the phenomenological parameter.

EXPERIMENTS

Membrane Preparation

The crosslinking agent used in our experiments was amic acid. The method of synthesis of amic acid was the same as ref [1]. 10 wt.% PVA and 51 wt % amic acid solutions both in dimethyl sulfoxide were mixed together with stirring for 24 hr at room temperature. The amic acid contents were all 8 wt %. The resulting

homogeneous solution was cast onto a glass plate and dried at 30 °C for 48 hr. Finally the membranes were dried at 40 °C for 5hr under vacuum and then cured at 150 °C for 90 min.

RESULTS AND DISCUSSION

The partial flux of water is increased with its own driving force and the decrement of degree of hydrolysis. In case of the partial flux of isopropanol, increased with the decrement of degree of hydrolysis at the full range of concentration. The phenomenological deviation coefficient of water permeation is not affected by the increment of concentration of water in feed mixture and degree of hydrolysis but in case of isopropanol, increased with the increment of concentration of water in feed mixture and degree of hydrolysis. In case of the selectivity to water, it is increased with the increment of degree of PVA hydrolysis and increased with the increment of concentration of isopropanol in feed. In view of the results so far achieved, the degree of PVA hydrolysis is favorable to the selectivity but not to flux because of the crystallinity and polarity of polymeric membrane. Also the water and isopropanol fluxes as a function of the feed water content suggests that a permeation coupling might occur during the sorption or/and the membrane transport steps.

References

1. C. K. Yeom and R. Y. M. Huang, Pervaporation separation of aqueous mixtures using crosslinked poly(vinyl alcohol), I, Die Angew. Makrom. Chem., 184 (1991) 41.