Development of Charged Mosaic Membrane and Estimation of its Membrane Performance -Novel Membrane Technology for Salt Enrichment-

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Summary

Aims: Our goal is to establish a novel membrane technology for salt enrichment using charged mosaic membrane which has two different charges, cation and anion exchange sites. For the practical application, a fundamental study such as elucidation of material transport mechanism will be required. In previous study, we indicated that the simple electrolytes in solution are preferentially transported more than solvents(water) across the charged mosaic membrane and the salt enrichment by pressure dialysis are prospective. In purification of amino acid from the mixed solution containing salt, this kind of membrane may be a powerful tool for desalination process. For the potential application, the transport characteristics across the membrane must be clarified on the basis of fundamental viewpoint. Then the observation of transport phenomena was examined extensively.

Membrane: Charged mosaic membranes obtained by casting the mixed solution of cationic microsphere gel(4VP/DVB) and anionic microsphere gel(SSNa/DVB) were supplied from Dainichi-Seika Color & Chemicals Mft Co. The membrane thickness was about 50 μm and the membranes were deposited in 0.1 mol dm^{-3} KCl solution before experimental use.

Transport studies: The cell for experiment is consisted of two half glass cells and the charged mosaic membrane was tightly clamped between the two cells. Temperature was kept constant by circulating 25 ^{0}C water around the two cells during experiment. Two kinds of measurements, the volume changes and concentration changes of electrolyte solutions across the membrane were mainly measured as functions of time by using a graduated capillary and an electrode type conductive meter, respectively.

Results: The volume flux, Jv and salt flux, Js were deduced from the volume changes and concentration changes and were analyzed according to practical linear phenomenological equation presented by Kedem & Katchalsky. As a result, three important membrane parameters were obtained. Interestingly, reflection coefficient indicated relative low value as compared with ordinary charged membrane. The result was supported by a good correlation with permeability coefficient obtained from salt flux. As a conclusion, it was indicated that the charged mosaic membrane is effective in desalination from salt containing solution or electrolyte/nonelectrolyte separation.

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