A BASIC STUDY ON CONCENTRATION OF SEA WATER DRIVEN BY PRESSURE DIFFERENCE(2)

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Summary

Though an electrodialysis using the ion exchange membranes is an excellent technology to get salts from sea water, the method consumes a large amount of electric power in the process. As more effective separation of salts from sea water, a pressure dialysis is attractive in respect that the technique drives the salts directly instead of a large quantity of solvent by using the pressure difference. Unfortunately, such a practical membrane suitable for the pressure dialysis has not been obtained to the present.

Our study aims to make a way to potential application through fundamental analysis of salt transport phenomena based on nonequilibrium thermodynamics.

In this work, 3 charged membranes, an amphoteric ion exchange membrane, a charged mosaic membrane and a cation exchange membrane which indicate the different charge morphologies within the membranes were investigated. Under the appropriate osmotic pressures which were generated by sucrose, the volume flux, Jv and salt flux, Js were measured in the membrane-salt solution system. KCl, $CaCl_2$, $MgSO_4$ solutions were used as the examined electrolyte solutions. The obtained Jv and Js were analyzed by the practical phenomenological equation presented by Kedem & Katchalsky and the filtration coefficient, Lp, reflection coefficient, σ and solute permeability, ω which are characteristic of the membranes, were estimated. As an interesting result, σ in case of the charged mosaic membrane exhibited the negative value. This suggests that the membrane transports the salt in preference to the solvent. On the other hand, in order to get more detailed information concerning the systems, a streaming potential was measured by using silver-silver chloride electrode. From the results, the electroosmotic coefficient, β was estimated for each charged membrane. These parameters were discussed in relation to the salt and solvent transports.