

Development of Salt Production System Based on Highly Concentration of Seawater

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Summary

Highly concentration techniques of seawater are promising for developing highly efficient salt production systems and lowering a salt production cost. Seawater is concentrated by about 5 times using a present electrodialysis process. In principle, if a water transport can be reduced to one-half its present value by employing the ion exchange membrane which carries low water permeability, a saturated seawater should be obtained.

In view of designing a novel ion exchange membrane, the conventional membrane parameters such as electroosmotic coefficient, β and filtration coefficient, L_p were rearranged on the basis of fundamental physicochemical units about the ion exchange membranes and summarized. On the other hand, the salt producing data in electrodialysis were analyzed from basic physicochemical aspect and the factors controlling the effective salt enrichment were investigated. It turned out that the electroosmotic coefficients play an important role in electrodialysis and the value required for saturated brine concentration was proposed that the β and L_p were $0.6 \times 10^{-3} \text{ cm}^3 \text{ C}^{-1}$ and $0.92 \times 10^{-8} \text{ cm}^3 \text{ N}^{-1} \text{ s}^{-1}$, respectively.

Novel ion exchange membranes based on a crystalline polystyrene and a porous polyethylene embedded polyelectrolyte, polystyrene sulfonate or polyvinylpyridine, have been fabricated. These non-bridged membranes gave low water permeability and high ionic conductivity and will be useful for the highly concentration of seawater.