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. Seawater is concentrated by about 5 times using a present electrodialysis process. If a concentration factor can be increased by 8 or 9 times, saturated seawater should be obtained. In principle it is necessary to reduce water transport by use of the ion exchange membrane which has low electroosmotic and low osmotic coefficients.

We have analyzed mass transfer parameters by thermodynamic consideration, determination of electroosmotic and osmotic coefficients, calculating mass transfer rates from the data of salt manufacturing plants, and simulation of transport phenomena for designing plants and the optimal characteristics of the membrane for highly concentrating seawater have been estimated.

Novel ion exchange membranes based on crystalline polystyrene have been fabricated. These membranes gave low water permeability and high ion permeability and will be useful for the highly concentration of seawater. The optimization of membrane preparation methods and characterization of the fabricated membranes are required to enhance the membrane performance.