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Development of Crystallization Technology for Recovering Valuable Resources from Salt Production Process including Multi-component Ions with High Grade and High Efficiency

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Summary

Introduction In the desalination process of seawater, it is possible to simultaneously reduce the environmental load and recover valuable resources by lowering the total salt of the concentrated sea water. There are previous studies to recover Mg^{2+} as $Mg(OH)_2$, in which another compound other than $Mg(OH)_2$ may precipitate at the same time. Therefore, it is necessary to consider the process of recovering only the compound of Mg. By combining seawater desalination process and salt recovery process with Mg recovery process as a integrating process, fresh water and salt and valuable resource $Mg(OH)_2$ will be obtained at the same time. The Mg precipitates changes depending on component and composition of process fluid. So, it is necessary to consider the relation between the process fluid and species and crystal quality of Mg precipitates. The purpose of this proposed study is to investigate a method of recovering $Mg(OH)_2$ from various process fluid which consists of various ions and composition.

Results and Discussion It is considered that as the total salt concentration decreases, more impurities precipitated. By confirming the influence of carbon dioxide in the air, it was found that the bittern and concentrated seawater are less susceptible to carbon dioxide, but brine and seawater are more susceptible to carbon dioxide. When recovering $Mg(OH)_2$, it was possible to show the necessity of considering the concentration of carbon dioxide dissolved in seawater. Consequently, it can be said that conditions for stable precipitating of $Mg(OH)_2$ were determined for various different process fluids. In the chemical equilibrium calculation, it was found that the experimental results can be expressed well if any influence of carbon dioxide is taken into consideration in any fluid. So it was shown that the dissolved concentration of carbon dioxide is an important condition for determining precipitated materials.

Conclusion It was possible to find the dominant condition for recovering $Mg(OH)_2$ from each process fluid by combining chemical equilibrium calculation and experiment. In addition, by evaluating the quality of crystals obtained from each in terms of contaminants, we could show the policy of which process fluid should be selected for the recovery of $Mg(OH)_2$.