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## Possibility Studies on Integrated Utilization Technologies of Sea Water Resources with Environmental Preservation

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### Summary

#### Introduction

In salt industry, reconstruction of industrial structure is required in order to reduce energy cost and increase process efficiency. In resource-starved Japan, sea water resources have attracted attention until now. Then, it is required to investigate the integrated utilization technology of sea water resources in detail. In this surveillance study, the following five contents were mainly investigated. (1) Re-consideration of the sea water resources. (2) Investigation of the high-value-added technology of the chemical compounds originating in the sea water resources. (3) Reappraisal of the production economy of the resources. (4) Trend survey of utilization technology of sea water resources. (5) Proposal of novel integrated utilization process for sea water resources.

#### Results and Discussion

The novel utilization process is integrated process which consisted of CO<sub>2</sub> capture, desalination, salt production and soda process. Magnesium hydroxide is removed from the sea water by PH adjustment. CO<sub>2</sub> is fed into demagnesium sea water, and CO<sub>2</sub> is captured as calcium carbonate. The sea water is fed into a reverse osmotic membrane process after sulfate ion is removed. The residual of desalination water is fed to an ion exchange membrane as condensation sea water. The condensation sea water is fed into a salt production process. The salt is fed to an electrolytic soda process. Sodium hydroxide and hydrogen chloride which are needed for PH adjustment are obtained in this soda process. In future work, the following studies are essential for practical realization of this proposed process. (1) Cooperation of a different industrial process. (2) Differentiation with an overseas process. (3) Detailing of the operating condition in process construction. (4) The design of the speciation model for sea water.