

Press Release

July 15, 2020

WASEDA University
JGC Corporation
Sasakura Engineering Co., Ltd.

New Technology Development to Utilize CO₂ by Converting it into a Stable Resource has been Selected as a ‘NEDO Project Contributing to a Sustainable Society by Significantly Reducing Greenhouse Gases’

<Key points of announcement>

- There is a growing need to effectively utilize carbon dioxide (CO₂) as part of global warming countermeasures.
- This project will work on the development of a technology that reacts CO₂ with the magnesium contained in seawater, producing a resource that can be used as a building material such as the aggregate in concrete.
- If this technology is established and commercialized, it is expected to lead to a significant reduction in CO₂ emissions while effectively utilizing waste. It could therefore contribute to the realization of a sustainable society.

Waseda University, JGC Corporation, and Sasakura Engineering Co., Ltd. announced today that their joint proposal for “CO₂ mineralization using desalination brine or seawater with profitable polyproduction of commodities*1,” led by Professor Takao Nakagaki, Faculty of Science and Engineering, Waseda University, has been selected for a fiscal 2020 public call project of the New Energy and Industrial Technology Development Organization (NEDO): “Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation / Development of Technologies for CO₂ Reduction and

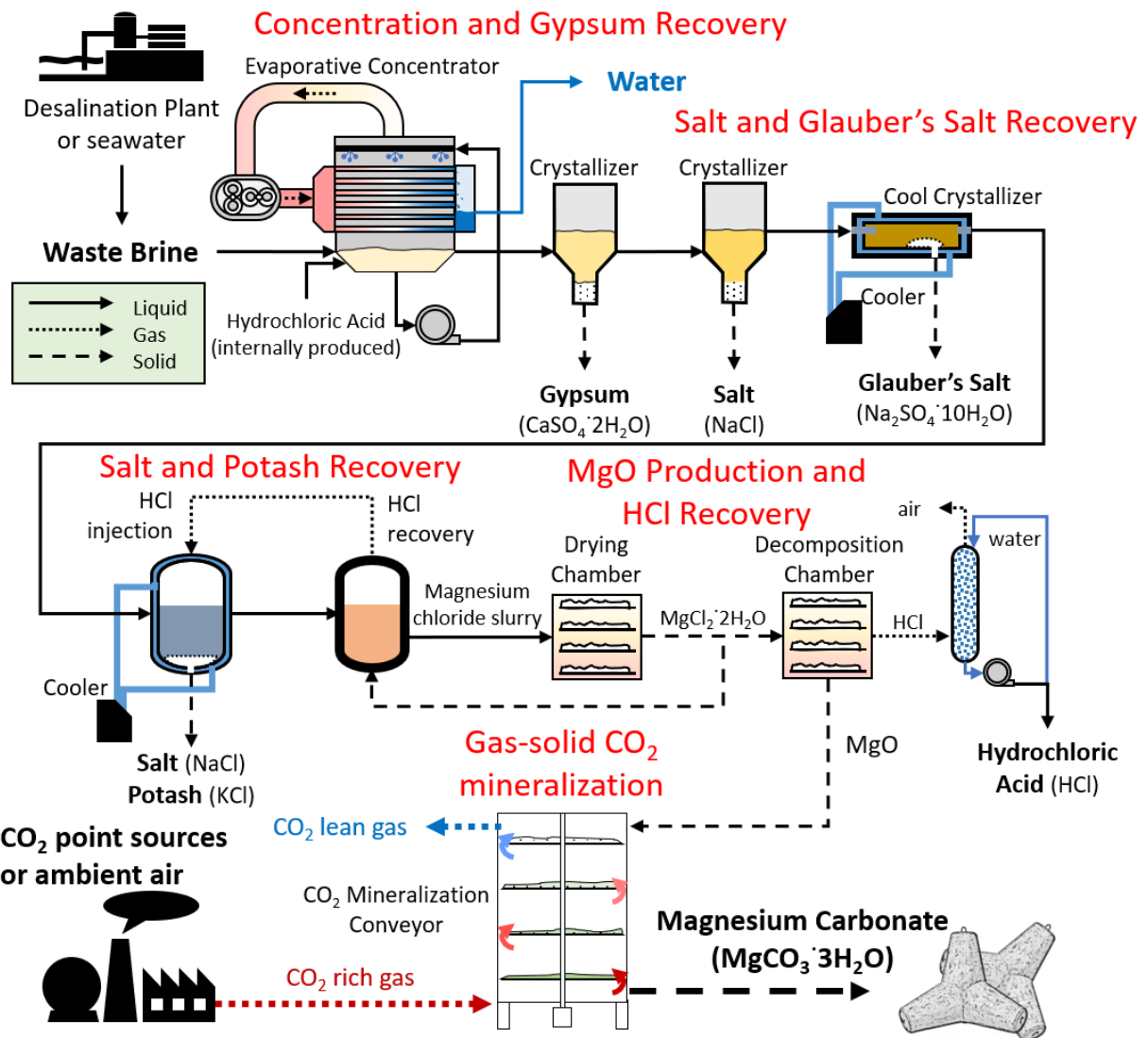
Utilization / Development of Technologies for CO₂ Utilization in Carbonates, Concrete Products, and Concrete Structures.”

As global warming countermeasures become increasingly important around the world, reducing greenhouse gas emissions has become one of the key challenges. Given this situation, CO₂ mineralization technologies that convert emitted CO₂ into a stable resource are expected to contribute to the reduction of greenhouse gases.

This project will develop a series of technologies that react CO₂ emitted from power plants, industry, and the like with magnesium contained in seawater and desalination brine^{*2}, which is the waste water from seawater desalination plants. This process converts CO₂ into a stable mineral called magnesium carbonate, which can then be used as a building material such as the aggregate content of concrete. Since seawater and desalination brine are abundant, this technology is expected to provide a significant amount of CO₂ reductions. The other major ions in seawater and brine (calcium, sodium, potassium, and sulfur) are also converted into industrial products (gypsum, salt, fertilizer, sodium sulfate, and hydrochloric acid) and additional fresh water is produced. The production of multiple commodities increases profitability and societal co-benefits. This technology development project will aim to establish the reduction of CO₂ emissions throughout the entire process while securing profitability and market scale.

Waseda University, JGC Corporation, and Sasakura Engineering will contribute to the realization of a sustainable society by establishing solutions to social issues such as CO₂ reduction and effective utilization of waste through the development of this technology and subsequent commercialization efforts.

<Example development process>



<R&D items and responsibility>

Waseda University

- Development of a process to produce magnesium oxide from waste brine and magnesium oxide from magnesium chloride
- Development of a process for gas-solid mineralization of CO₂ using magnesium oxide
- Practical evaluation of magnesium carbonate usage in concrete

JGC Corporation

- Evaluation of the usefulness of magnesium carbonate
- Evaluation of process scale-up and implementation

Sasakura Engineering Co., Ltd.

- Development of a low-energy method for magnesium chloride production via nanofiltration (NF membrane)^{*3}

<Notes>

*1 Co-production of multiple valuable commodities

The development of technology to use seawater or brine from seawater desalination plants and renewable energy to co-produce valuable commodities such as soft water, gypsum, sodium sulfate, salt, fertilizer, and hydrochloric acid without adding any chemical additives. Solid magnesium oxide is obtained via a hydrate of magnesium chloride, reacted with gaseous CO₂ (from flue gas or the air) to form magnesium carbonate, and utilized effectively as aggregate in concrete.

*2 Desalination brine

The wastewater discharged in the process of separating freshwater from seawater. It has a salt concentration nearly double that of seawater. Because of its high salinity, per unit volume, more magnesium can be extracted from brine than seawater.

*3 NF membrane

NF (nano filtration) membranes selectively allow monovalent ions such as Na⁺ and Cl⁻ to pass through while preventing the transmission of divalent ions and pigments. This makes it possible to extract magnesium efficiently.

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* As part of measures to prevent the spread of COVID-19, office hours are 11 AM to 3 PM on weekdays.

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