

# Enhanced CO<sub>2</sub> Geological Storage and Mineralization Using Rock Dissolution by Biodegradable Chelating Agents

Safe, Secure, and Efficient CCS: A Key to Decarbonization

## Overview

In recent years, CO<sub>2</sub> geological storage using mafic and ultramafic rocks—such as basalt and peridotite, which are rich in calcium and other metal elements that react with CO<sub>2</sub> to form carbonate minerals—has garnered global attention as a means of reducing atmospheric CO<sub>2</sub>, a major contributor to global warming. However, subsurface environments for CO<sub>2</sub> storage are typically low in temperature and therefore have limited reactivity. Additionally, the amount and connectivity of pores as well as permeability of the subsurface rocks are not always sufficient, presenting significant challenges that require innovative technological solutions.

In storage methods that involve dissolving CO<sub>2</sub> in water, the use of seawater is preferable. However, during the storage process, it is also necessary to temporarily suppress the reaction between metal ions in seawater and CO<sub>2</sub> until the CO<sub>2</sub> is securely stored.

This invention promotes CO<sub>2</sub> geological storage and mineralization by using biobased, biodegradable chelating agents that enhance mineral dissolution and capture metal ions. By dissolving minerals in subsurface rocks using the chelating agents, the amount and connectivity of pores (CO<sub>2</sub> storage capacity) increase, and the permeability (CO<sub>2</sub> injectivity) is also improved. Furthermore, when CO<sub>2</sub>-charged seawater containing the chelating agents is injected into subsurface rocks, it becomes possible to simultaneously store both CO<sub>2</sub> and the metal ions required for carbonate mineral formation with creating additional rock porosity.

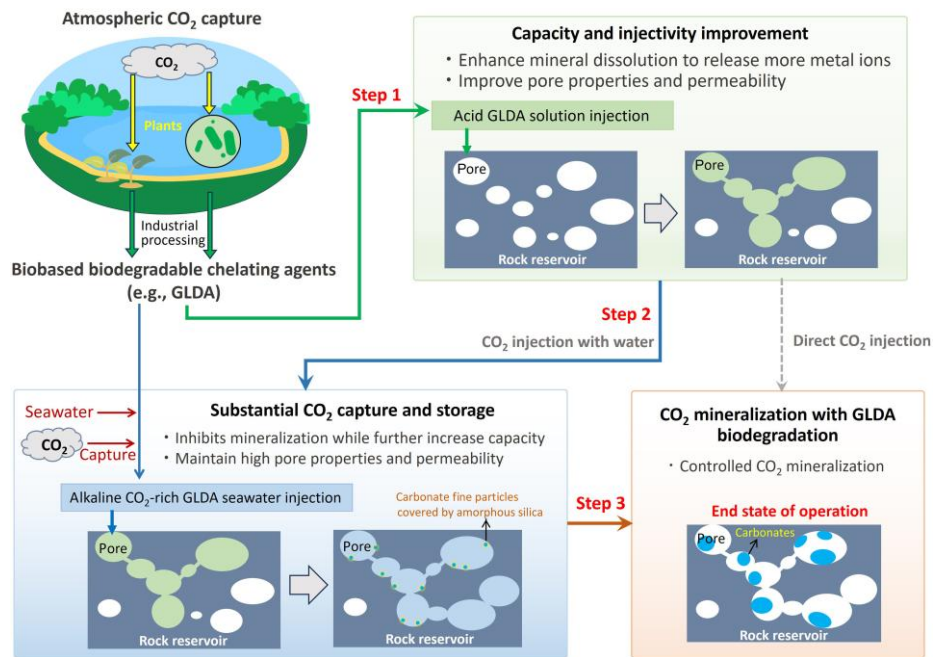
## Product Application

- ❑ Geological storage of hydrogen
- ❑ Development of natural hydrogen resources

## IP Data

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## Concept of CO<sub>2</sub> Geological Storage and Mineralization Enhancement Technology



## Related Works

[1] Wang et al. , CO<sub>2</sub> capture, geological storage, and mineralization using biobased biodegradable chelating agents and seawater. *Sci.Adv.* **10**, eadq0515(2024). DOI:10.1126/sciadv.adq0515

[2] Tohoku University Press Release "Invention of a CO<sub>2</sub> Reduction Technology Using Plant-Based, Biodegradable Materials — Making CO<sub>2</sub> Geological Storage and Mineralization Safer, More Secure, and More Efficient —" <https://www.tohoku.ac.jp/japanese/2024/11/press20241118-01-co2.html>

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