

Carbon dioxide fixation method

Contributing to carbon neutrality through CO₂ fixation technology using Ca/Mg-containing wastes as raw materials!

Overview

The CO₂ fixation technologies so far typically employ alkaline earth metals to fix CO₂ by converting it into chemically stable carbonate minerals. However, the conventional technologies are difficult to apply on a large scale because of its slow reaction rate, high cost and potential environmental concerns due to the use of a large amount of pH adjusters.

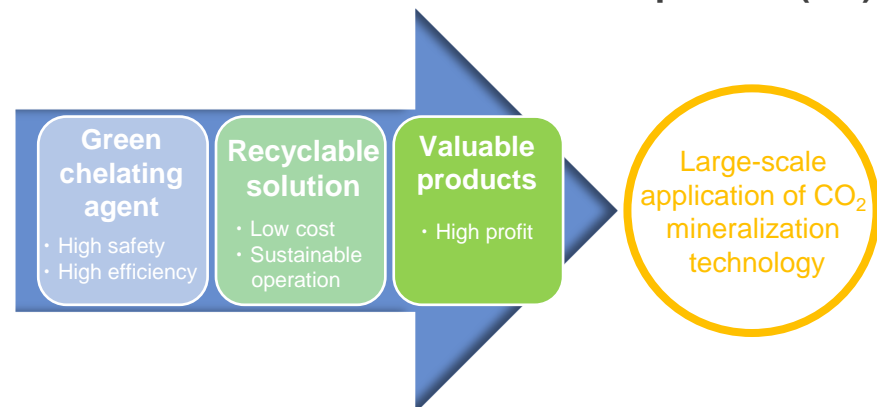
This invention discloses a novel CO₂ fixation process that enables to run under 100°C and ambient pressure without using large amounts of pH adjusters. It can run continuously at low cost by regenerating and recycling of the chelating agent (e.g., GLDA) solution within the process. This invention also enables the production of high-purity carbonates, such as CaCO₃, and oxides, such as silica, by using Ca/Mg-containing wastes, including combustion ash, waste concrete, and slag, as Ca/Mg sources. The chemicals obtained in this sustainable CO₂ fixation technology, such as CaCO₃, are expected to be used in industries such as pigments, rubber, and desiccants.

Product Application

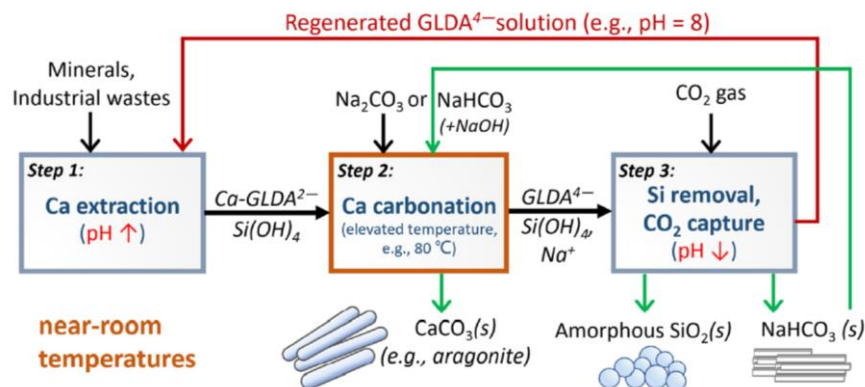
- ❑ Carbon Dioxide Fixation Equipment
- ❑ Reuse of Ca/Mg-containing wastes
- ❑ Commercial use of reaction products in fillers, pigments, fertilizers, and cosmetics productions, etc.

IP Data

IP No. : JP7345791、US20240042374、CN116635131
 Inventor : Noriaki Watanabe、Jiajie Wang、Noriyoshi Tsuchiya
 Admin No. : T20-1059



CO₂ fixation under low temperature and pressure conditions



Related Works

- [1] Jiajie Wang. et al. *Journal of Environmental Chemical Engineering*, 10 (2022) 107055
 [2] Jiajie Wang. et al. *Scientific Reports*, 11 (2021) 13956

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Carbon dioxide fixing method

Efficient CO₂ fixation process that allows sustainable reuse of the extraction solution

Overview

In recent years, significant efforts have been devoted globally to the reduction of CO₂ reduction, with CO₂ fixation as one of the measures is attracting increasing attention. Conventional CO₂ fixation methods face economic and environmental challenges such as the large consumption of chemicals and the generation of wastewater. To address these limitations, the inventors developed a CO₂ fixation process using industrial by-products and rocks as raw materials, together with a recyclable chelating agent (e.g. GLDA) aqueous solution as the extraction solution (Patent No. 7345791). However, with repeated use of the extraction solution, unwanted ions from the raw materials accumulated in the solution, leading to a decreased CO₂ fixation efficiency. To mitigate this issue, an enhanced, efficient, and sustainable CO₂ fixation method was developed by incorporating an additional step for the removal of undesired ions from the extractant.

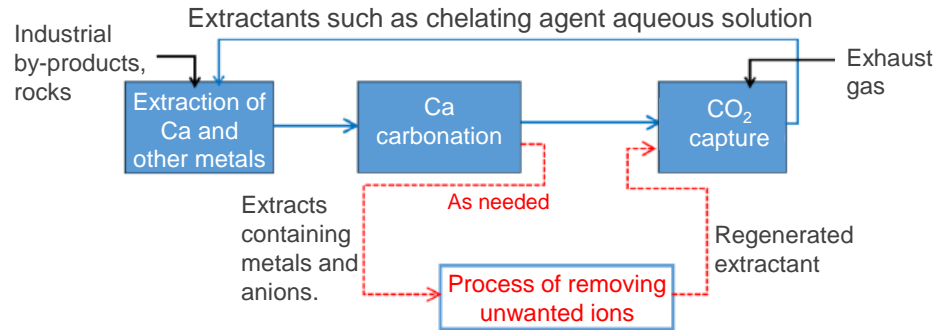
The present invention is characterized by its effective utilization of underexploited Ca/Mg-containing wastes (combustion ash, waste concrete, slag, etc.) as raw materials for CO₂ fixation. Furthermore, it is expected to address the problem that unwanted ions accumulation in the extraction solution during the recycling use of the solution, a challenge that can occur in other CO₂ fixation methods.

Product Application

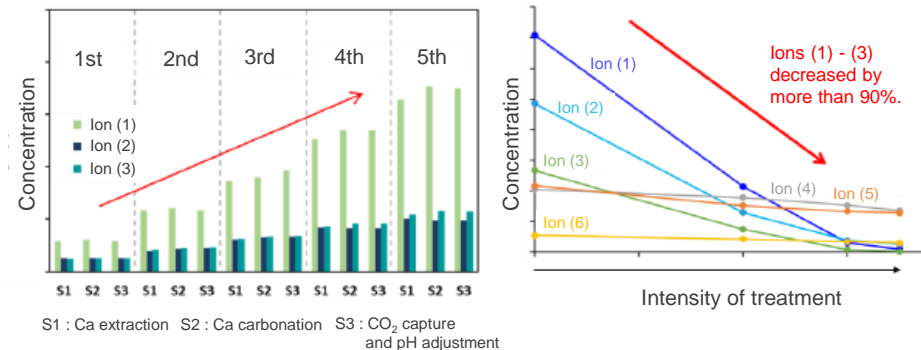
- ❑ CO₂ fixation
- ❑ Reuse of waste containing Ca/Mg
- ❑ Removal of harmful ions from waste

IP Data

IP No. : JP2024-088814
 Inventor : Noriaki Watanabe, Jiajie Wang
 Admin No. : T23-099



Various unwanted ions effectively removed from the extraction solution



Recycling use of the extraction solution leads to accumulation of unwanted ions

The accumulated unwanted ions (ions (1)-(3)) were decreased by the removal process. In contrast, the useful ions for CO₂ fixation (ions (4)-(6)) remained.

Related Works

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