Cyclic Capture of Atmospheric CO2

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Overview

Reducing greenhouse gas emissions alone will not be enough to limit the impacts of climate change - active removal of COâ‚‚ from the atmosphere is essential. CycCap addresses this need with a cyclic process in which a salt solution is electrochemically split into alkaline and acidic streams. The alkaline solution captures atmospheric COâ‚‚ through aeration, while recombination with the acidic stream triggers rapid, energy-free release of pure COâ‚‚ and simultaneous regeneration of the original salt solution. This closed-loop system operates without consumable reagents or waste generation and can be implemented at scale using mature industrial electrodialysis and aeration technologies.

Applications

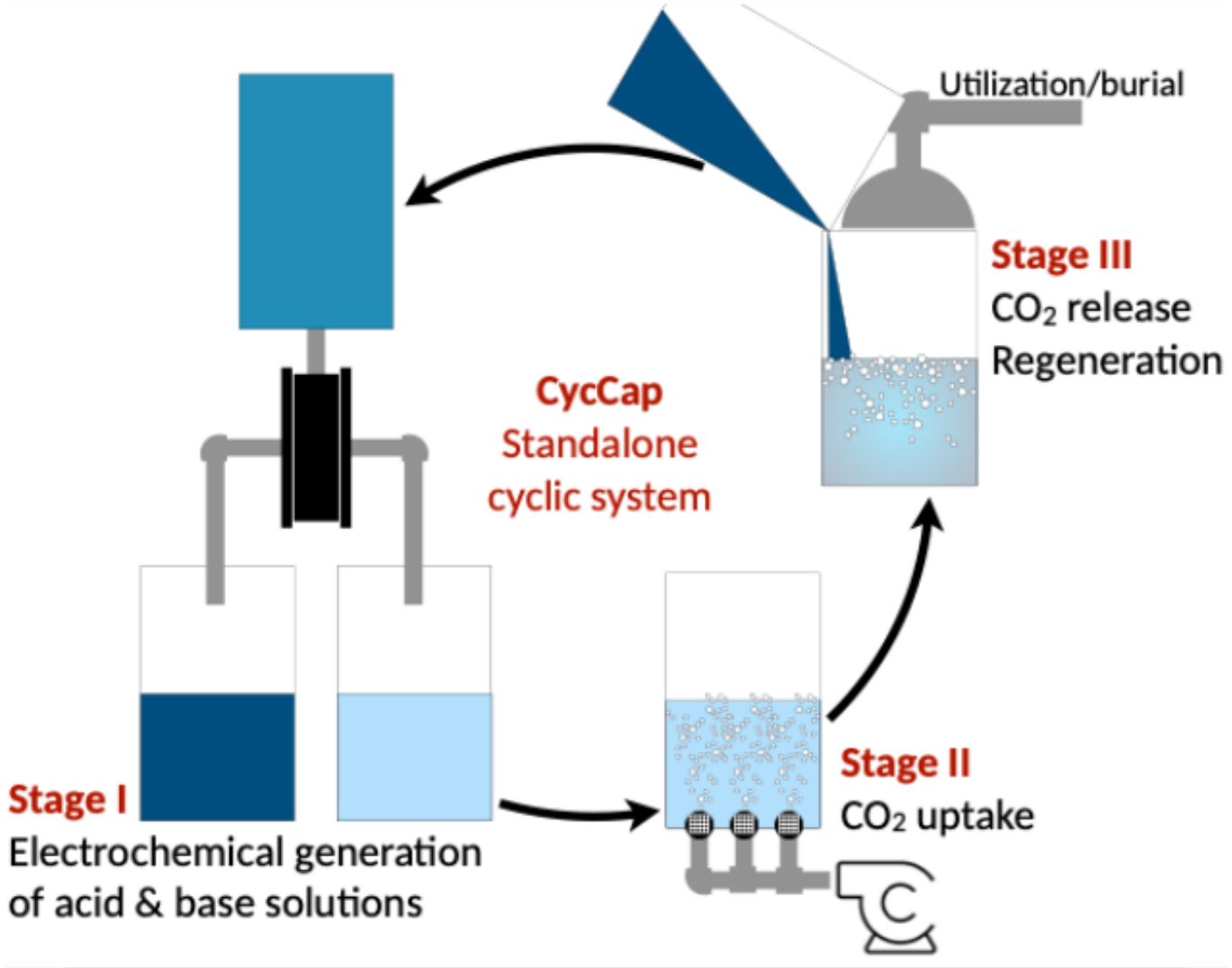
- Large-scale removal of atmospheric COâ‚‚ for climate stabilization
- Integration with COâ‚‚ utilization processes
- Deployment at industrial sites to capture both flue gas emissions and atmospheric COâ‚‚, maximizing removal capacity and leveraging shared infrastructure

Differentiation

- No ongoing chemical inputs:Â no additional alkalinity or consumables needed
- No waste generation:Â only pure COâ‚‚ is produced for utilization or burial
- Energy-free COâ‚‚ release: rapid, spontaneous release without heat or pressure
- Scalable & low-cost: uses established industrial equipment to achieve capture costs below ~$100/ton

Development Stage

- Laboratory proof-of-concept completed, demonstrating efficient, repeatable COâ‚‚ capture and release using commercially available electrodialysis and pumping equipment.
- Optimization of batch parameters is underway, with a flow-through lab-scale system in development.


Utilization/burial
Stage III
CO_2 release
Regeneration
CycCap
Standalone
cyclic system
Stage I
Electrochemical generation
of acid & base solutions
Stage II
CO_2 uptake