Systems and Methods for Carbon Sequestration with Organic Matter Sulfurization

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BACKGROUND

Due to continuing human emissions of CO_2 from fossil fuel burning and land use change, atmospheric CO_2 concentrations have dramatically increased over preindustrial conditions, driving demonstrable changes in global temperatures, precipitation, storm intensity, ocean pH, and the biological processes that depend on these parameters. Active Carbon Dioxide Removal (CDR) can be used, alongside drastic emissions reductions, to keep the increase in mean global temperatures below 1.5°C and to avoid severe consequences of climate change. While efforts have been made to develop CDR methods that aim to cultivate and sink marine macroalgae, less attention has been paid to storage of terrestrial biomass in aqueous systems. In both cases, the major environmental risks associated with sinking and sequestering biomass stem from the breakdown and oxidation of that biomass to release CO_2, nutrients, and protons (pH change). Therefore, minimizing rates of biomass breakdown during storage can be a primary objective of CDR technology development.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed an organic-matter-sulfurization approach for marine carbon sequestration. The process uses chemical sulfurization, as a natural preservative, of bundled or baled biomass to enhance the preservation potential of organic carbon stored in aqueous environments within lakes, reservoirs, or deep anoxic basins in the oceans. Sulfurization of biomass can be achieved through either placement of biomass within naturally sulfidic waters or through the introduction of sulfate reducing microbes within the bundles of biomass materials. Slower remineralization rates of sequestered biomass minimize the environmental risks of biomass sinking and storage, including acidification and the release of nutrients, CO_2, and methane. This method utilizes natural chemical reactions and environments in combination with existing infrastructure resulting in a low commercial barrier to entry.

ADVANTAGES

- Minimizes the rate of biomass breakdown during storage
- Potential to durably sequester climatically-relevant quantities of organic carbon
- An alternative to the carbon neutral conversion of biomass to methane or ethanol
- Provides a valuable tool for combating climate change

APPLICATIONS

- Carbon sequestration
- Green technology

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

carbon, carbon sequestration, sulfurization, marine carbon sequestration, marine carbon, chemical sulfurization, organic carbon, biomass

CATEGORIZED AS

- **Environment**
  - Other
- **Materials & Chemicals**
  - Biological

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