Net Negative CO2 and Methane Producing Bioreactor

A bioreactor that uses sunlight and CO2 dissolved in seawater to simultaneously generate methane from the decomposition of algae and sequester CO2 in the coccoliths of growing algae.

Competitive advantage

- CO2 dissolved in sea water is at 20x the concentration atmospheric CO2. Algae growing in seawater use sunlight and this CO2 to produce energy rich lipids and calcium carbonate rich coccolith skeletons. The bioreactor provides the appropriate conditions for good algae growth in an aerobic environment on its surface and at the base of the reactor, the right condition for anaerobic archaea to breakdown the algal lipids to produce methane that is removed as a fuel. The remaining cocolyths are removed in a batch process and stored as sequestration of CO2 (the precursors of limestone). The Biorector provides methane as a renewable fuel and sequests CO2 as calcium carbonate or limestone.
- A bespoke bioreactor
- A combination of expertise to leverage existing technology in a combined approach to achieve net negative CO2 production and produce a renewable energy source (methane) from solar energy

More Information

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Impact

- Production of renewable fuel
- Capture of CO2 to reduce the atmospheric concentration of greenhouse gases

Successful applications

- Design and commissioning of a bespoke bioreactor for net negative CO2 and algal methane production
- Proven methane generation from methanogenic archaea decomposing algae and of CO2 incorporation in algal coccoliths

Capabilities and facilities

- Lab facilities biogas experiments
- Bioreactor for algal growth and methanogenic archaea decomposition