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The Development of a Slow-Release Sequestering Fertilizer, by an Integrated Process of Hydrogen Production from Biomass, and the Direct Sequestration of Fossil Fuel CO2 Emissions

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This project investigates a potentially profitable method to sequester carbon dioxide. The novel process uses agricultural, forestry and waste biomass by extracting hydrogen using pyrolysis and reforming technologies conducted in a 50 kg/hr pilot demonstration. A pyrolysis temperature profile was discovered that results in a carbon char with an affinity to sequester CO_2 through gas phase conversion with mixed nitrogen-carrying nutrient compounds within the pore structures of the carbon char. This produces a novel enriched carbon slow-release sequestering fertilizer. The process is particularly applicable to fossil fuel power plants as it also removes SO_x and NO_x, does not require energy intensive carbon dioxide separation and operates at ambient temperature and pressure.

A bench scale project demonstrated a continuous process fluidized bed agglomerating process. The total amount of CO_2 sequestration was managed by controlling particle discharge rates based on density. In this experiment seven kilograms of the material were produced for further plant growth response testing.

The method of sequestration uses existing farm fertilizer distribution infrastructure to deliver a carbon that is highly resistant to microbiological decomposition. The physical structure of carbon material provides a physical slow release mechanism of adsorbed mixed nutrients. The objective of this project was to demonstrate the methods of production at a continuous bench scale production level and produce sufficient material for an initial evaluation.
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