Biofuel Production & Wastewater Treatment Using Ammonia Oxidizing Bacteria

Current trends in energy production and consumption are economically and environmentally unsustainable. Using biological carbon dioxide sequestration to produce biofuels has been identified as one potential solution for this developing energy crisis. This technology uses ammonia oxidizing bacteria (AOB) to produce the biofuel isobutanol. AOB have the ability to fix and reduce CO2 while oxidizing ammonia found in waste water streams to nitrite. After applying metabolic engineering techniques, the engineered microbe can produce isobutanol, a biofuel that can readily replace gasoline with no engine upgrades required. Additionally this technology can be used in microbial fuel cells and reverse microbial fuel cells to produce energy or to encourage further carbon reduction and biofuel production.

Utilization of Ammonia Oxidizing Material Provides a Carbon Neutral Solution to Fuel Production

Utilization of biofuels currently has several limitations including excessive fertilizer run-off, high land use, and difficulty in balancing the bio-ethanol production cycle. These issues limit market growth and provide significant challenges that need to be met. This technology takes advantage of bacteria that use atmospheric CO2 to produce biofuels, thus utilizing a process that can potentially be carbon neutral. Additionally coupling this process with waste water treatment could be an additional economic and environmental benefit to energy producers.

AOB have been shown to reduce CO2 while oxidizing ammonia in laboratory reactors. Work is continuing towards efficiently producing biofuels and optimizing microbial fuel cell use.

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Applications:
- Method of biofuel production.
Production of energy using microbial fuel cells or further carbon reduction and biofuel production in reverse microbial fuel cells.
With modifications, the production of other commodity chemicals may be possible

Advantages:

- Uses atmospheric CO2, making the process potentially carbon neutral.
- Produces isobutanol, a biofuel that does not require any automotive modifications.
- Reduces cost associated with current fuel cell technology by using ammonia.
- When coupled with wastewater treatment, there is a large economic and environmental incentive.

Patent information:

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Available for licensing and sponsored research support
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